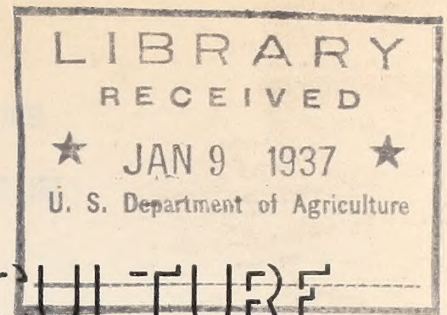


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UNITED STATES
DEPARTMENT OF AGRICULTURE



BUREAU OF
ENTOMOLOGY AND PLANT QUARANTINE
NEWS LETTER

VOLUME IV, no. 1

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U.S. DEPARTMENT OF JUSTICE
FEDERAL BUREAU OF INVESTIGATION
WASHINGTON, D.C. 20535

REPORT OF INVESTIGATION



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NEWS LETTER

FOR NOVEMBER 1936

Vol. IV, No. 1

(Not for publication)

January 1, 1937

FRUIT INSECT INVESTIGATIONS

Shade-cloth protection of drying pears.---H. C. Donohoe and Perez Simmons, of the Fresno, Calif., dried-fruit insect laboratory, report that experimental drying of pears on protected stacked trays gave satisfactory exclusion of the raisin moth. Pears covered with shade cloth during drying on stacked trays and during temporary storage in picking boxes became infested only 1 percent. Exposure of the fruit during stack drying resulted in infestation of 23 percent of the halves. Pears not protected at any time (the usual procedure) became infested 56 percent. The results correspond with those obtained in 1935. Drying under shade cloth produced cleaner fruit, of better color and texture.

Parasitization of Japanese beetle by *Tiphia popilliavora* crosses.---At the Moorestown, N. J., laboratory, T. R. Gardner has made studies of crossing several strains of *T. popilliavora* Roh., an imported parasite of the Japanese beetle. Grubs parasitized in September and October by the Korean strain and by crosses of this with the Japanese strain, have been examined recently to determine the extent of cocoon formation. The results are shown in the following table.

Strain	: Grubs	: Cocoons	: Cocoon
	: parasitized	: formed	: formation
	: Number	: Number	: Percent
Korean-----	: 32,045	: 24,345	: 75.9
F-2 generation, Korean female	:	:	:
X-Japanese male-----	: 3,568	: 2,606	: 73.4
	:	:	:
F-2 generation, Japanese female	:	:	:
X-Korean male-----	: 2,925	: 2,174	: 74.3

Citronella oil a possible substitute for geraniol as Japanese beetle attractant.---The Moorestown laboratory reports work, on which F. W. Metzger has been engaged, concerning the possible substitution of citronella oil for geraniol as bait for Japanese beetle traps. Nine samples of Java citronella oil and an equal number of Ceylon citronella oil proved to be somewhat more attractive than the grade of geraniol now used, but, when eugenol was added, a precipitate formed in a number of the samples of Ceylon oil. On the basis of present information there appears to be no definite correlation

between attraction and the chemical and physical properties of oil of these two types, but it is evident that at least certain grades of citronella oil are promising cheaper substitutes for geraniol.

Experimental rearing of oriental fruit moth parasites.--Experiments conducted this season by G. J. Haeussler, of the oriental fruit moth project at Moorestown, indicate the possibility of utilizing growing peach trees enclosed in a cloth-covered cage for rearing certain species of oriental fruit moth parasites. The tests were made in a large cage constructed over 30 3-year-old trees, the cage being divided into 8 compartments in which most of the various species were tested individually. An increase in the number of females produced over the number used for rearing was obtained for only three species--Bassus diversus Mues., Diocles molestae Uch., and Orgilus longiceps Mues. Production of female progeny was fairly good also for Eugadizon extensor (Linn.) and Macrocentrus thoracicus (Nees), reared together, Macrocentrus ancyllivorus Roh., Glypta rufiscutellaris Cress., and the imported Japanese Apanteles spp. The sex ratio in the last three named was particularly in favor of the females. Other species tested gave entirely unsatisfactory results. Observations indicated that the trees used in early season tests with B. diversus remained in much better condition throughout the season with regard to continued availability of succulent twigs suitable for infestation than those on which tests were delayed until parasites of the other species became available. This was partly responsible for the comparative success obtained in the rearing of B. diversus. The experiment has indicated that all of the species named above can be reared with varying degrees of success from caged trees by the methods used this season, provided the inoculations are started early enough in the season and undue competition between species is avoided. The results obtained with the species tested are summarized in the following table.

Species	Period of test	Females used	Progeny produced	Average progeny per female	Sex ratio, females to males
		Number	Number	Number	Percent
<u>Bassus diversus</u> -----	5/20-8/5	124	2,233	2,218	18.0 : 99.3
<u>Diocles molestae</u> -----	6/29-7/24	100	339	119	3.4 : 35.1
<u>Orgilus longiceps</u> -----	6/9-8/17	106	355	128	3.3 : 36.1
<u>Eugadizon extensor</u> and					
<u>M. thoracicus</u> -----	6/8-8/13	89	261	63	2.9 : 24.1
<u>Macrocentrus ancyllivorus</u> ---	7/30-8/17	75	114	61	1.5 : 53.5
<u>Glypta rufiscutellaris</u> ---	7/31-8/17	74	57	38	.8 : 66.7
<u>Apanteles</u> spp. (Japan)---	6/29-7/10	91	25	15	.3 : 60.0
<u>Tachinid</u> spp. (Japan)---	7/8-7/16	*46	1	0	0 : 0.0
<u>Cremastus</u> spp. (Japan)---	7/8-7/24	27	0	0	0 : --
<u>Pristomerus vulnerator</u>					
(Panz.)-----	7/8-7/24	19	0	0	0 : --

*Includes both sexes.

MEXICAN FRUIT FLY CONTROL

Fewer flies trapped than last year.--Throughout November, weather conditions in the lower Rio Grande Valley have been ideal for field work and the harvesting of fruit. Inspectors have been able to make more than the customary number of grove inspections and reports indicate that almost 100 percent of the groves are in excellent sanitary condition. Fruit shipments to the end of November total approximately 2,625 equivalent carloads. Three carloads have moved by water to eastern markets. Trapping records indicate that the adult fly population is considerably below that of last season. Only 5 Anastrepha ludens Loew. have been taken so far this year, while for the same period last season 34 had been trapped.

CEREAL AND FORAGE INSECT INVESTIGATIONS

More data on second generation of European corn borer in the Lake States.--As reported previously, midsummer pupation of corn borer larvae in the vicinity of Toledo, Ohio, was greater in 1936 than in any previous year on record. A. M. Vance and K. D. Arbuthnot, of the Toledo laboratory, now add the following observations. During the fall survey of borer abundance, from August 15 to September 15, evidence was procured to show that a partial second generation of the insect in 1936 was widespread in the surveyed portions of Michigan, Ohio, and Indiana. No midsummer pupation was found in western New York. Moths emerging from corn borer pupae, formed near the end of July or in the first few days of August in 1936, near Toledo, oviposited in late corn, the second-generation eggs hatched normally, and the larvae produced were able to reach maturity in the fall. Based on a count of 95 masses in the field, the average number of eggs per mass in the second generation was 21.7, as compared with the smaller average of 15.4 eggs per mass in the first generation of the same year. It is believed that sustained abnormally high temperatures near mid-July were responsible for the noticeable midsummer pupation in 1936. The biological reactions of the second-generation individuals overwintering to reproduce in 1937 is of considerable interest.

Laboratory rearing of European corn borer parasite on other hosts.--W. G. Bradley, Toledo, reports on preliminary observations to determine the suitability of Ephestia kuehniella Zell. as a medium for laboratory production of Chelonus annulipes Wesm., an egg-larval parasite of the European corn borer, following the successful adaptation of this host for similar purposes in the case of the pink boll worm parasite, Chelonus blackburni Cam.: "Through the courtesy of the Entomological Branch of the Canadian Department of Agriculture, a few mated Chelonus females were obtained. A supply of a rapidly developing genetic strain of the Mediterranean flour moth, in various stages of development, was obtained locally and adults from this material produced sufficient eggs for the extremely limited investigations here reported. It was found that eggs of E. kuehniella, supplied to gravid parasite females, were oviposited on quite as readily as are the eggs of Pyrausta nubilalis Hbn. From the 11 females from which parasitization of eggs was started, about 200 males and 100 females were produced in the first generation. Synchronization of host and parasite development was very exact, as is customary with this braconid. The average

interval between oviposition and emergence of the adult was found to be 44.4 days at a constant temperature of 80° F. and a constant R. H. of 70 percent. Emergence of host adults and parasite adults started at the same time and the emergence curves of each were closely parallel. A loss of parasites was experienced somewhere between the time when the parasite larvae were in the early instars and the time of adult emergence, since, following a hatch of over 75 percent of the host eggs, dissections of small host larvae showed a fairly high percentage of parasitization, although subsequent parasite production was low. Although sufficient time has not elapsed to produce adult offspring from parents reared from E. kuehniella, dissections of host larvae show that females from this source are capable of producing viable eggs. Adults reared on flour moth larvae are shorter than normal for the species (6-7 mm, as given by Thomson), averaging about 4 mm. Attempts to obtain parasitization by Chelonus in the eggs of Sitotroga cerealella Oliv. were unsuccessful. Parasite females, actively ovipositing in eggs of E. kuehniella, showed no interest in grain moth eggs when these were substituted for those of the flour moth."

Field-corn resistance to European corn borer.--L.H. Patch and G. T. Bottger, Toledo, report on the comparative results with inbred strains tested in 1935 and 1936: Of 136 inbreds tested in 1935, 17 had percentages of borer survival lower than was expected on the basis of the trend with date of tasseling. Of the 17 inbreds, 15 were tested in 1936. In addition, six inbreds having high borer survival in 1935 and seven having intermediate survival were also tested. These additional 13 inbreds served as standards for comparison with the 15 inbreds thought to have some resistance to the borer. The percentages of borer survival in 1935 and 1936 are as follows:

Inbreds	Borer survival	
	1935	1936
	Percent	Percent
Six with high survival in 1935-----	13.4	8.9
Seven with intermediate survival in 1935:	7.9	8.3
Fifteen with low survival in 1935-----	6.1	7.5

It may be noted that the range in the percentage of borer survival in 1935 was from 6.1 to 13.4, whereas in 1936 the range was from 7.5 to 8.9. The greatly decreased range in 1936 compared with 1935, was chiefly due to the date the plants became infested, with relation to the date of tasseling. In 1935 the eggs hatched on July 28, when many of the strains were tasseling. In 1936 the plants were infested on July 13, several days before any of the inbreds tasseled. Of the 15 inbreds with a low borer survival in 1935, 6 were relatively low in 1936, as shown below.

Delayed

also

Inbreds	Borer survival	
	1935	1936
	Percent	Percent
Michigan 77-----	4.4	1.8
Illinois R4-----	5.1	4.0
Michigan 106-----	5.6	4.7
Iowa L317-----	3.3	5.3
Iowa I205-----	6.7	5.6
Kansas Y.S. 56-----	4.9	6.9
Means-----	5.0	4.7

The 1936 mean of the low-survival strains of 4.7 percent is 2.8 less than the group mean of 7.5 percent. The difference cannot be accounted for on the basis of the tassels, because the effect of tassels as a factor was slight, if any, in 1936. In addition, two of the seven inbreds with intermediate survival in 1935 were somewhat lower than the average in 1936. One was Missouri K7, with 9.2 and 6.4 percent borer survival in 1935 and 1936, respectively. The other was Iowa B1 345, with 7.7 and 6.6 percent borer survival in 1935 and 1936, respectively.

Large-scale collections of European corn borer parasites in Massachusetts.--C. A. Clark and E. D. Burgess, of the Moorestown corn borer laboratory, report the completion of a large collection of material to furnish parasites for colonization in 1937. From 25 to 30 men were used during most of November and over 191,000 corn borer larvae were obtained. Parasitization of these larvae is expected to average approximately 24 percent, or considerably higher than the average parasitization of material received in previous years from Europe and the Orient. The 1936 collection was made in the vicinity of Concord, Mass., where imported parasites were liberated from 10 to 15 years ago and have now increased to a point where it is practical to make collections for colonization in other parts of the corn borer infested regions of the United States.

Critical temperature for flight of pea aphid.--L. P. Rockwood and Max M. Recher, of the Forest Grove, Oreg., laboratory, report that alate viviparous females of *Illinoia pisi* Kalt. were taken from a plot of common vetch that had been seeded on September 4 and were placed on plants of transplanted Austrian winter field peas in a pot under a lantern globe in the laboratory on November 24. On the next morning, before heat was turned on, the pot of peas with alates was placed on a table near an east window and the lantern globe was removed. A small thermometer was suspended so that its bulb was close to the pea-plant tips. A close watch was kept on the alates. They soon began flying singly at a temperature of 61° F. Only 2 out of 14 that took flight in 15 minutes sustained flight long enough to reach the window 30 inches away. Most of them flew only from 4 to 6 inches down to the table. The experiment was repeated with the same procedure on November 27, when the initial temperature was 49°, before the heat was turned on. Slight movement on foot began at 50°. Most of the alates were stirring at 55° and one spread her wings but did not fly. Spreading of wings by individuals occurred eight times in 26 minutes between 58° and 60° and a few aphids dropped to the table without flying. At 60° one alate

flew to the window, 33 inches of sustained flight. One female was observed to spread her wings 10 times at temperatures between 60° and 61° before she finally flew 3 inches. Spreading of wings was general between 60° and 61° but only five flew in 15 minutes, four flying only 3 to 4 inches. Between 61° and 62°, in 11 minutes, six flew, one 36 inches, diagonally to the window, the others, from 3 to 8 inches. The relative humidity in the room was 49 percent and the air was still. Observations were made in the field on alate viviparous females occurring naturally on a plot of common vetch on the afternoons of November 24 and 25. The thermometer was suspended on a level with the vetch-plant tips, 3 inches above the ground. Alates on vetch tips were watched for 45 minutes on November 24. Three were observed to fly (one twice) from 2 to 4 inches from the tip of one plant to the tip of another or down to the lower part of a stem. Temperatures ranged from 65° to 63°. Alates were observed to spread wings several times before flight. They seemed to be deterred by the intermittent breezes and actual flight occurred only in quiet periods. Macrosiphum granarium Kby., the aphid parasite Aphidius testaceipes Cress., small Diptera, aleyrodids, and jassids were flying readily at these temperatures. Sweeping over the plot, without touching the vetch tips with the rim of the net, caught no I. pisi. This indicated that no sustained flights were taking place. Relative humidity, registered on a hygrograph at 4 feet from the ground, was about 40 percent. On November 25, during similar observations for 1 hour and 15 minutes, I noted one alate which flew a few inches at 62° and another that flew 2 inches at 61°. One female spread her wings five times at a temperature between 61° and 60°, but did not fly. Two were observed to spread their wings at 56° to 55°. At 54° a few alates walked down the stems to the lower part of the plants. An Aphidius was observed to fly, sluggishly, at 55°. The air was quiet and the relative humidity, in the kiosk, was about 50 percent. These observations indicate that temperatures of at least 60° are necessary for flight of alate I. pisi that have matured in November, and that temperatures above 65° would probably be necessary for sustained flight from field to field.

JAPANESE BEETLE CONTROL

Improved eradication method.--Tree medication is now being employed to kill all elms in areas for which clearances have been obtained to clear-cut the properties. The new treatment, which closely resembles the method successfully employed to kill stumps of eradicated elms and to prevent sprouting, requires little time, few tools, and inexpensive materials. A girdle of bark about 12 inches wide is removed around the trunk of the elm to be treated, and a band of copper sulphate, in solid, crystalline form, is bound around the girdle and held in place by a suitable waterproof material. This results in the quick death of the tree and in the diffusion of a sufficient concentration of the chemical under the bark of the tree to prevent beetle infestation. There are approximately 2,600,000 elms in the 10-mile protective zone and 3,300,000 in the major diseased area that could be advantageously treated in this manner. Were these elms, which are of no aesthetic or commercial value, to be chemically treated and in addition approximately 1,000,000 dead or dying trees removed in the work area, there would be formed surrounding the infected area a barrier zone in which the

only remaining elms would be those of aesthetic value. Work in inaccessible portions of the area would be eliminated. Chemically treated elms are permitted to remain standing for later utilization as fuel or lumber. To November 28, chemical treatments had been applied to 178,645 elms.

Trunk sampling locates Dutch elm diseased trees.--An experimental trunk-sampling project has just been completed in cooperation with the pathologists of the Bureau of Plant Industry at the Morristown, N. J., Dutch elm disease laboratory. Trunk samples were taken from 1,006 elms at St. Elizabeths College, near Morristown. This area was surveyed during the summer and a considerable number of infected trees were found. The trunk sampling was started about the time the leaves were falling and after the scouts had finished their systematic surveys of the section. Of the trees sampled, 41 were later confirmed as infected. Eighteen of these had been tagged by the scouts as possibly infected, 4 had been tagged as dead and dying elms, and 19 were without tags. Thus, by the trunk-sampling method the number of diseased trees found in this woodland was more than doubled.

Requisitions for additional W. P. A. workers.--A requisition was submitted to the New Haven, Conn., W. P. A. office for 108 unskilled laborers to be used on copper sulphate treatment of trees in the Branford, Conn., district. Requisitions have been placed with the New York W. P. A. offices for 740 additional men, bringing the New York quota of men on security wage to 1,500. In New Jersey, requisitions were placed for from 300 to 400 additional men to bring the State W. P. A. personnel up to approximately 4,000.

Governors Island free from Dutch elm disease.--Although Japanese beetles have proved troublesome on Governors Island, in New York Harbor, the Dutch elm disease has not yet reached that point. There are 60 elms on the island. Last summer these were examined on June 26, July 23, and August 3. No evidences of disease symptoms were noticed in the trees and none of them were classed as devitalized.

Christmas-tree inspection.--Those engaged in cutting Christmas trees in the lightly infested gypsy moth area report increased demands for the trees, with a possibility of the operators being unable to fill orders. A heavy fall of snow in northern Maine has held up cutting of both large and small trees. Trees of table size, about 12 to 18 inches in height, are completely buried, and the larger trees are difficult to cut and tie in deep snow. In Vermont the demand for balsam exceeds the supply, and some of the buyers are taking spruce as a substitute for balsam. One Christmas tree operator in Vermont is cutting about 150 Christmas trees that range from 20 to 40 feet in height. These are for use in hotels, banks, churches, public parks, and communities. Considerable expense is involved in the cutting, tying, hauling, and loading of such trees, and prices are necessarily high when the trees are shipped long distances. Inspection of these large trees also presents quite a problem.

Inspections increase in New England States.--Increased business in the New England territory is indicated by the larger volume of products presented for inspection. The stone and quarry industries are working

overtime on orders for curbing for many miles of sidewalks being built along State highways. Increased building activities have created demands for more lumber. Lumber shipments tied up by the strike on the West coast have also created additional outlets for New England lumber. The demands for nursery stock this fall have exceeded those of several past fall-shipping seasons. There is now quite an outlet for trees for State-highway landscaping. New England nurseries that customarily dig deciduous stock for winter storage, to have it in readiness for early spring shipments, are placing more stock than ever in storage this fall. Extra inspectors have been required to examine the stock for gypsy moth infestation prior to storage.

Florida-bound plants and soil surrendered at road post.--Among the trucks stopped by the road inspector on the shift from midnight to 8 a. m. on November 19 was one covered with a tarpaulin and containing a horse. In response to the inspector's usual query, the driver stated that he had no plant material on his load. While examining the rear of the truck to confirm the driver's statement, the inspector saw some green foliage protruding through a hole that the horse had kicked in a hogshead in the truck. When this was brought to the driver's attention he admitted that he had on 50,000 greenhouse-grown tomato and pepper plants that he was taking from Schwenkville, Pa., to Deerfield, Fla., for planting. The temperature was below freezing at the time, but the driver claimed that the heat from the horse kept the plants from freezing. Rather than return to the area for proper inspection or wait until the following morning for inspection at the post, the driver surrendered the plants at the road station. His anxiety to surrender them was probably due to the fact that he did not expect to be caught transporting uncertified plants. Immediately upon their removal from the truck the plants froze. Examination of the large amount of soil accompanying the plants failed to reveal any Japanese beetle larvae.

Chemical treatments discontinued in Detroit and Chicago.--Freezing weather has forced discontinuance of soil treatments of sections infested with the Japanese beetle in Detroit and Chicago. Treating work in Chicago was begun on August 24 and continued until November 16. During that time soil on 105.2 acres was treated. In Detroit, 48.2 acres was treated while this work was in progress from October 6 to November 6. Very little work was possible in either city in November, as rain and low temperatures hampered the work. Treatments will be resumed in both of these cities as early as possible next spring. The only assistance rendered to the States by the Division of Japanese Beetle Control in these treating programs consisted of furnishing spray outfits, spray truck operators, and supervisors.

Railway Express drivers require quarantine instruction.--A recent change in the method of billing express shipments in Boston has necessitated the instruction of from 200 to 300 truck drivers in quarantine certification requirements. Until recently all shipments were brought into the receiving platform and were billed through the local office. This method has now been changed, and each driver is permitted to receive a shipment and bill it through direct to the consignee, collection being made from the consignee. This necessitates that quarantine information be supplied to each truck driver, whereas heretofore one man at the receiving platform was in a position to cull out uncertified shipments of quarantined products.

Still certifying stock in Baltimore.--Certified nursery stock is still moving in good volume from the Baltimore district, despite the fact that the ground is quite dry and a recent cold spell froze the soil to a depth of 1 or 2 inches. From all indications, local nurseries will complete their fall season with larger quantities of stock sold than in any fall since predepression days. This is partially attributed to the fact that home construction in the Baltimore area during the first 10 months of 1936 has resulted in the expenditure of nearly \$10,000,000, according to figures released by the F. S. Dodge Corporation of New York.

Mums go South for the winter.--A large grower of chrysanthemums in the Philadelphia area has devised a new method of handling his stock plants. This year's stock plants, minus the blooms, are being dug, washed, and shipped to Florida, where arrangements have been made for planting them outside. Cuttings will be made from the plants with the idea that the cuttings will harden off and produce better stock plants for next year than those propagated in the Philadelphia area. Next summer the new plants will be returned to the grower and planted in his nursery. About 2,000 stock plants have thus far been inspected, certified, and shipped to Florida.

Fumigations to meet quarantine requirements.--A large nursery at Rutherford, N. J., has just completed the treatment with paradichlorobenzene of 22,600 hydrangeas in 3- to 6-inch pots, 35 cubic yards of soil being used in this treatment. Approximately 1,200 azaleas were also treated with the same fumigant for a South Jersey nurseryman. A large greenhouse at Freehold, N. J., was treated with carbon disulphide preparatory to certifying it for the propagation of geranium plants. Another greenhouse at Washington, D. C., used naphthalene flakes to treat the dirt floor in order to prepare it for certification.

FOREST INSECTS

Egg parasites of Malacosoma spp.--J. V. Schaffner, Jr., of the New Haven, Conn., laboratory, reports as follows on the egg parasitization of Malacosoma disstria Hbn. and M. americana Fab.: "Malacosoma disstria Hbn.--Late in the fall of 1935, 199 egg clusters were collected in some of the heavily infested localities of western Massachusetts and Vermont to obtain data on egg parasitization. Recently these data have been summarized and the parasites identified. Ooencyrtus clisiocampae Ashm. was found to be the most common of the three species of parasites reared. Ablerus clisiocampae Ashm. and Telenomus clisiocampae Riley were recovered in small numbers. The results are tabulated below.

Locality	Egg clusters	Approximate eggs	Parasites	Parasitization Percent
	Number	Number	Number	
Massachusetts:				
Shelburne-----	8	1,360	34	2.5
Vermont:				
Bellows Falls---	72	14,328	284	2.0
Do-----	17	3,247	60	1.8
Brandon-----	6	1,194	59	4.9
Pawlet-----	51	6,018	404	6.7
Rupert-----	8	1,048	111	10.6
Springfield----	37	5,032	329	6.5
Total-----	199	32,227	1,281	--
Average-----	--	--	--	5.0

"One collection of 16 egg clusters of M. americana was made at Bellows Falls, Vt., in the fall of 1935. These contained approximately 3,136 eggs from which 230 parasites were reared, or an average of 7.3 per cent. Three species of parasites were represented. Tetrastichus malacosomae Gir. was by far the most important species, while O. clisiocampae and T. clisiocampae were present in small numbers."

Willows severely damaged by insects.--Native willows in the vicinity of Coeur d'Alene, Idaho, are being severely damaged by two insects, Agrilus sp. and Cryptorhynchus lapathi L., reports W. D. Bedard, of the Coeur d'Alene, Idaho, laboratory. This injury is interesting because Agrilus appear to act as the primary agent in most cases, with C. lapathi acting in a secondary role. Periodic examinations indicate that the buprestid kills a portion of the willow shoot from the top toward the base and may kill the entire shoot by repeated attacks during one or more seasons. Usually, however, a green portion is left at the base of the willow, which is then attacked by the weevil. Although quite severe in the vicinity of Coeur d'Alene, this injury is of not great economic significance primarily because willow is a temporary phase in the ecological successions of local forest types. In addition, all top-killed willow shoots are sprouting copiously from the base, which insures sufficient ground cover.

Students inspect laboratory.--J. C. Evenden, Coeur d'Alene, reports that on November 14 a group of 50 students from Washington State College, accompanied by R. L. Webster, head of the zoology department, and R. D. Shenefelt, instructor in entomology, visited the field laboratory at Coeur d'Alene. A series of illustrated lectures showing important forest insects, as well as the work of the laboratory, was given by the laboratory personnel.

Ips beetles cause extensive damage in Black Hills.--L. G. Baumhofer, of the Fort Collins, Colo., laboratory, reports that large groups of ponderosa pine ranging from sapling to mature size were killed by Ips oregoni Eichh. and Ips ponderosae Sw. in the Black Hills of South Dakota during the past season. Many of these groups contained more than 100 trees. Damage was most prevalent on poor sites, along the margins of timberland, on rocky

points, and in farm yards. Losses were also heavy in an area suffering from winter injury, in the central part of the Hills, although not all winter-injured trees were attacked by Ips. Comparatively little damage occurred in thinned areas, except for small patches killed in some stands thinned last winter. These bark beetles normally infest fresh slash, logs, and weakened or dying trees. The present damage apparently resulted from a weakening of the trees by the very severe drought of 1936. Similar damage, on a smaller scale, occurred in the drought year of 1934. In 1935, when spring rainfall was above normal, this widespread damage by Ips disappeared and it is anticipated that with the return of normal precipitation, injury will again subside.

Forest tent caterpillar.--L. W. Orr, of the Milwaukee, Wis., laboratory, reports that the forest tent caterpillar outbreak in northeastern Minnesota was much more extensive in 1936 than in 1935 and present indications are that it will continue in 1937. Many of the summer-resort areas have suffered serious losses because of the caterpillar nuisance. Studies of the development of the insects during the summer showed that a large proportion of the larvae reached maturity, except in areas where they were so abundant that complete defoliation occurred before the caterpillars matured. In such areas there was a very high mortality. An average of between 30 and 40 percent of the cocoons produced adult moths. Egg counts made this fall indicate that, although the infestation will be decreased considerably in the older areas, the newer centers will be more heavily infested next year and much new area will be involved.

Spruce budworm on jack pine.--The pine-defoliating form of the spruce budworm has caused severe defoliation of jack pine in various parts of the Lake States in recent years, although little timber was actually killed prior to 1936. A number of new outbreak areas appeared last summer and Mr. Orr reports that the defoliation was unusually severe, resulting in considerable mortality in many of the affected stands. The defoliation was followed by the period of extreme heat and drought, and it is believed that this sequence of events explains the apparent greater destructive effects of the 1936 outbreak. It is now feared that there may be some danger of an Ips outbreak building up in the defoliated and weakened stands.

Drought plays important part in locust borer emergence on large trees.--R. C. Hall, of the Columbus, Ohio, laboratory, reports that during the past season numerous instances have been noted in central Pennsylvania, southern New York, and northern New Jersey of heavy emergence of locust borer adults from large roadside trees that had previously shown little or no emergence. Previous records and observations have shown that in normal years there is rarely any emergence of adult beetles from locust trees 6 inches or more in diameter. Records for 1936 show heavy emergence in trees as large as 24 inches in diameter. It appears that the severe spring and early summer drought made conditions favorable for locust borer development in large trees, and the combined effect of drought and heavy locust borer injury has killed many heretofore thrifty mature trees.

Insect carriers of Dutch elm disease.--C. W. Collins and T. H. Jones, of the Morristown, N. J., laboratory, submit final results of an experiment conducted during 1936 in cooperation with the Bureau's Dutch elm disease eradication unit and the Division of Forest Pathology of the Bureau of Plant Industry. From late in May until early in September a man was stationed at each of six points located in New Jersey areas where elms were numerous and where elms attacked by the Dutch elm disease had been previously found and removed. These men collected insects attracted to three felled elm trees. Six weeks after a tree was felled it was burned and another was felled in its place. Insects attracted to the trees were collected individually in gelatine capsules and sent to the laboratory for identification. Those insects known or suspected to breed in elm were submitted to the Division of Forest Pathology and were cultured to determine whether they were carrying the Dutch elm disease fungus (Ceratostomella ulmi). Except for species obtained in negligible numbers or those suspected of being infrequent in elm, the culture results are given in the following table.

Species	: Adults	: Adults giving C.
	: cultured :	: <u>ulmi</u>
	: Number	: Number: Percent
<u>Scolytus multistriatus</u> Marsh-----	7,200	: 492 : 6.83
<u>Hylurgopinus rufipes</u> Eich.-----	141	: 6 : 4.25
<u>Saperda tridentata</u> Oliv.-----	75	: 0 : --
<u>Neoclytus acuminatus</u> Fab.-----	553	: 0 : --
<u>Xylotrechus colonus</u> Fab.-----	89	: 0 : --
<u>Chrysobothris femorata</u> Oliv.-----	203	: 0 : --
<u>Anthaxia</u> sp.-----	82	: 0 : --
<u>Magdalis armicollis</u> Say-----	1,421	: 1 : 0.07
<u>M. barbata</u> Say-----	337	: 0 : --
<u>M. inconspicua</u> Horn.-----	474	: 0 : --
<u>Conotrachelus anaglypticus</u> Say---	140	: 1 : 0.71
<u>Xylosandrus germanus</u> Blandf.-----	842	: 1 : 0.11
<u>Xyleborus</u> sp.-----	24	: 0 : --
<u>Xylobiops basillare</u> Say-----	118	: 2 : 1.69

In connection with the above experiment, elm wood infested with the immature stages of various insects was placed in large screened cages in the laboratory yard. This wood was obtained from trees cut down in the field and was known to contain the Dutch elm disease fungus. Insects that issued from the wood were collected individually in gelatine capsules and were cultured. Those species from which the fungus was obtained are listed below. Cage 1 contained wood collected during the winter of 1935-36 and cage 2 contained wood collected during the summer of 1936.

Species	:Adults cultured:	:Adults giving <u>C. ulmi</u>
Cage 1	Number	Number : Percent
<u>Scolytus multistriatus</u> -----	1,911	: 219 : 11.45
<u>Hylurgopinus rufipes</u> -----	15	: 8 : 53.33
<u>Saperda tridentata</u> -----	139	: 31 : 22.30
<u>Magdalis armicollis</u> -----	192	: 26 : 13.54
Cleridae (undetermined)-----	4	: 2 : 50.00
<u>Capitonus saperdae</u> -----	46	: 3 : 6.52
<u>Lonchaea polita</u> Say-----	36	: 1 : 2.77
Cage 2		
<u>S. multistriatus</u> -----	1,090	: 411 : 37.70
<u>H. rufipes</u> -----	373	: 194 : 52.01
<u>Spathius canadensis</u> Ashm.-----	30	: 3 : 10.00
<u>C. saperdae</u> -----	11	: 4 : 36.36
<u>Platysoma coarctatum</u> Lec.-----	8	: 3 : 37.50
Hymenoptera (undetermined)-----	55	: 3 : 5.45

The results show that adults of various species that issue from elm wood containing Ceratostomella ulmi carry the fungus. These include species that feed in elm in the larval stage or species associated with them as parasites and predators. The mere fact that they carry the fungus does not necessarily indicate however that they are capable of transmitting the disease to healthy trees. To date, the European elm bark beetle (Scolytus multistriatus) has been found to be the most important insect carrier. The native elm bark beetle (Hylurgopinus rufipes) has been proved experimentally to inoculate green logs with the fungus and, to a lesser extent, healthy trees.

Tree medication to prevent insect breeding.--C. W. Collins and R. R. Whitten, Morristown, report that experiments conducted by the laboratory during 1935 and 1936 have shown that elm trees can be satisfactorily killed and subsequent bark beetle attack satisfactorily prevented by medicating them with copper sulphate. Copper sulphate is now being used for this purpose at the rate of 120 grams per inch diameter at breast height. Further experiments may show that this amount may be reduced. Sodium arsenite and ammonium bifluoride have also given promising results.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Progress of the gypsy moth project.--At the end of November the number of W. P. A. enrollees employed on gypsy moth work of various types in Connecticut, Massachusetts, New Jersey, New York, Pennsylvania, Maine, and Vermont had increased to 3,094. Since July 1, over 1,200,000 acres were scouted, principally in Vermont, Pennsylvania, Maine, and Massachusetts, and more than 750,000 egg clusters have been destroyed. Nearly 3½ million trees in open country were examined, over one-third of them in Vermont. Slightly more than 5,000 acres of woodland were thinned, with approximately four-fifths of the acreage concentrated in Massachusetts and Pennsylvania.

Snow forces temporary suspension of scouting.--Weather conditions were generally favorable for scouting in the New England area during the first 3 weeks in November; however, the first real snowstorm of the season, except for the mountainous regions of Vermont where snow fell in October, occurred on November 24 and 25. Scouting operations were temporarily suspended.

Large colony being eliminated in New York State.--Intensive clean-up work is being done at the site of a large infestation in Shawangunk, Ulster County, N. Y. In addition to the careful scouting of all trees and brush, all twigs, stones, and debris are being examined. The colony is in rural territory and is bisected by a main State highway. More than 14,000 egg clusters were located and destroyed by Federal workers by the end of November. These men are supervised by employees of the New York State Conservation Department working in close cooperation with the Federal Gypsy Moth Office.

No infestations found in New Jersey.--Particular attention is being given to the area surrounding an assembling cage in Mendham Township, Morris County, N. J., where a male moth was recovered during the summer. A special effort is being made to examine all small growth, dead wood, rocks, and ledges, which may soon be covered with snow. Crews are also engaged in very close scouting work in Passaic and Somerset Counties and in more open scouting in Essex, Morris, and Union Counties. No infestation has been found in New Jersey as a result of this work.

C. C. C. gypsy moth work increasing in New England.--Gypsy moth work performed by members of C. C. C. camps in Massachusetts, Connecticut, New Hampshire, and Vermont, in the region east of and adjoining the barrier zone, increased materially during November. Many new enrollees have completed their training period and have been transferred to field work, increasing the average number of men employed daily to 1,189 at the end of the month. Since July 1, C. C. C. men have scouted over 400,000 acres of woodland and more than 1,000 miles of roadsides; have examined nearly half a million isolated trees and more than 33,000 yards of stone walls; have thinned and cleaned over 2,500 acres of woodland; and have discovered and treated nearly 2,200,000 egg clusters. In addition, about 1,700 worthless isolated trees were destroyed.

Heavy infestation in Massachusetts being creosoted by C. C. C. men.--One phase of the work accomplished by the C. C. C. men is typified by their work in Bernardston, Franklin County, Mass. There is a heavy infestation of gypsy moths in this town in an area where maple, hickory, and ash predominate, with scattered pockets of gray birch, poplar, and oak. Although this growth is not considered especially favorable for the gypsy moth, the men have creosoted more than 25,000 egg clusters in an area of approximately 50 acres.

Preparation for future gypsy moth work in Massachusetts.--The E. C. W. Forester, assisted by a small crew of men from the Greenfield C. C. C. Camp, is engaged in type-mapping a block of woodland in Greenfield in preparation for future intensive gypsy moth work. They are also running base(or control)

lines at certain blocks in the northeastern part of Greenfield and extending into the southern part of Bernardston.

Consultations with officials and supervisors.--Conferences were held during the month with officials of the National Forest Service from New Hampshire and Washington, D. C., and with the Commissioner of Conservation of Massachusetts, and methods of cooperation were discussed. Meetings of senior gypsy moth foreman and camp superintendents were held to discuss and clarify certain phases of the work, and lectures, accompanied by motion pictures, were given to some of the new men in order to give them a clear idea of the work to be performed and the reasons for doing it.

Progress of the brown-tail moth work.--There were 878 employees working on brown-tail moth projects in Maine, Massachusetts, New Hampshire, and Vermont at the end of the month. Most of the crews formerly engaged in cutting out favored food plants and destroying brown-tail winter webs have now been transferred to scouting work, as the leaves have fallen from deciduous trees and scouting conditions have improved. Since July 1, over 800,000 trees have been examined, about 85,000 trees have been cut, and more than 170,000 webs have been destroyed. Over 160,000 of these webs were in Maine, and none were found in Vermont.

PLANT DISEASE CONTROL

Results of blister rust control work in 1936.--The western white pine region reports that during the 1936 Ribes-eradication season, 53,412,208 Ribes bushes were eradicated from 313,260 acres in the States of Montana, Idaho, and Washington, with 210,624 man-days of labor; an average of 170 Ribes and 0.67 man-days per acre. In the Rocky Mountain region, consisting of the States of Colorado and Wyoming, 758,762 Ribes were eradicated from 15,113 acres with 6,286 man-days of work. According to preliminary information from the North Central region 139,604 acres of white pine were given initial protection from blister rust in 1936 by the removal of 52,970,019 Ribes bushes from 597,933 acres of land.

White pine planting survives drought.--O. J. Dowd of Ohio, in connection with white pine blister rust control work in that State, recently made a survival check on the Mahoning Valley Watershed where 200,000 white pines were planted in 1936. Mr. Dowd reports that, notwithstanding the terrific drought and accompanying hot weather during the summer, 85 percent of the young white pines have survived.

Infected pines at blister rust infection centers in Oregon removed.--The infected western white and sugar pines at the two blister rust infection centers on the Siskiyou National Forest in Oregon, namely, Windy Valley and Panther Mountain, were recently removed by two parties of the blister rust personnel from the Oakland, Calif., office. At Windy Valley about 120 trees, all of them less than 22 inches in diameter, were felled. About 60 percent were sugar pines, as far as could be judged from the ratio of the number of cone-bearing trees of each species. Some 70 percent of the pines were infected; many, however, only slightly. At Panther Mountain 120 sugar pines,

including 7 mature trees, were removed from nearly 30 acres of steep, east-facing talus covered with dense brush, over which the infection extended. In addition seven large sugar pines were girdled. This removal of the pines is not regarded as a blister rust control measure to take the place of Ribes eradication, but only as a palliative that may delay the spread of the disease for 1 or 2 years. Its only advantage is to give more time for the establishment of a Ribes-eradication program in areas of commercial white and sugar pines.

Bulldozer operations in Montana.--During the week ending November 23, approximately 7,000 Ribes petiolare and 12,000 R. inerme bushes were eradicated along Big Creek near Haugan, Mont., by bulldozer and hand methods. Sixteen acres of heavy Ribes concentration in stream type were cleared during the week by slashing and bulldozer work. Although this progress measured in terms of acreage does not appear very great, the acreage, typifying the heaviest Ribes concentrations in the most difficult working conditions, represents the destruction of a very severe hazard along a considerable distance of stream. It is estimated that bulldozer work will be completed about the first of December.

COTTON INSECT INVESTIGATIONS

Cotton leaf worm control.--The early appearance and widespread distribution of Alabama argillacea Hon. last season made it necessary to use control measures in nearly all sections of the Cotton Belt and provided an opportunity at several field stations to test the efficiency of insecticides. The small larvae are easily killed with almost any arsenical insecticide, but the large larvae are more difficult to kill and frequently cause considerable defoliation before they can be brought under control. As a result, farmers use many forms of arsenic, from lead arsenate to white arsenic or cattle dip. It is often difficult to determine whether control measures will pay, as defoliation of the plants after the crop is practically made results in but little damage and may be of benefit in reducing the number of boll weevils which breed in late squares and go into hibernation. In an extensive series of cage tests made by G. L. Smith and A. L. Scales at Tallulah, La., the mortality of half-grown larvae after the use of various insecticides was as follows: Paris green, 91 percent; calcium arsenate, 90 percent; lead arsenate, 82 percent; 75 percent calcium arsenate-25 percent paris green, 90 percent; 90 percent calcium arsenate-10 percent paris green, 87 percent; 95 percent calcium arsenate-5 percent paris green, 87 percent; 50 percent calcium arsenate-50 percent lime, 88 percent; 50 percent calcium arsenate-50 percent clay, 86 percent; 50 percent calcium arsenate-50 percent sulphur, 84 percent; 50 percent lead arsenate-50 percent sulphur, 88 percent; 90 percent sulphur-10 percent paris green, 78 percent; 95 percent sulphur-5 percent paris green, 76 percent; cube, derris, and devil's-shoe-strings diluted with sulphur to 0.8 percent rotenone, 60 percent, 58 percent, and 40 percent, respectively; pyrethrum, 92 percent; 10 percent pyrethrum-10 percent paris green-80 percent sulphur, 65 percent; checks, 3 to 5 percent. At Florence, S. C., F. F. Bondy and C. F. Rainwater dusted two fields of late cotton for boll weevil control with a 1-2 mixture of calcium arsenate and lime, the last application being made on September 7.

By September 30 the untreated portions of the field were completely defoliated, while only a small amount of feeding was noticeable on the treated portions. On another farm, it was reported that dusting with lead arsenate failed to control the worms but calcium arsenate gave perfect control. The second generation of worms began stripping the plants at State College, Miss., about August 20. Most of the cotton fields were mature at the time and very little damage resulted. Two plots of late cotton where the bolls were not mature were dusted three times with calcium arsenate by H. C. Young at a cost of \$2.18 per acre. Two of the applications were washed off by rain shortly after being applied. An increase of 288 pounds of seed cotton and a profit of \$10.39 per acre were obtained. The plants had stopped blooming at the time and the increase in yield was due to the protection of the foliage enabling the bolls to mature and open normally. R. W. Moreland dusted some half-acre plots at College Station, Tex., on September 26 to determine the rate of killing with several insecticides. A shower of rain within 5 hours washed off part of the dust and a subsequent overflow of the river permitted only one examination to be made at the time. Twenty-six hours after the applications were made the mortality was as follows: Lead arsenate and lime (1-1), 46 percent; lead arsenate, 58 percent; lead arsenate and calcium arsenate (1-1), 60 percent; calcium arsenate, 74 percent; check, 0 percent. On October 14 the check plot was completely defoliated but very little ragging was evident in the other plots. K. P. Ewing and R. L. McGarr of Port Lavaca, Tex., report that a very hard fight was waged in many sections of southern Texas during July and August to bring this insect under control, owing to the more than 16 inches of rainfall in these 2 months. During the first week of July many farmers were required to poison twice in the same week, and probably more poison was used in this section than ever before. The insecticides used were calcium arsenate, lead arsenate, paris green, a surprising quantity of white arsenic, and in rare cases, cattle dip. Paris green was added to much of the calcium arsenate to give a quicker kill, and in some cases where the worms were large straight paris green was used. Lead arsenate used as a spray, 4 pounds to 50 gallons of water, applied with a barrel pump, was probably more extensively used in that section than any other insecticide. All of the arsenicals gave good control when they were not washed off by rains. On one farm 175 acres were dusted with a 3 percent nicotine sulphate-calcium arsenate mixture and gave 100-percent control of a heavy leaf worm population. Mixtures of calcium arsenate and sulphur 1-1 and 1-3 and mixtures of $7\frac{1}{2}$ to 10 percent paris green and sulphur used for boll weevil and fleahopper gave good control, while at greater dilutions the control was in proportion to the arsenical content. No control was obtained with 10 and 20 percent pyrethrum-sulphur mixtures. A. J. Chapman and H. S. Cavitt report that in the Presidio Valley of Texas the farmers kept the leaf worms in check by spraying with calcium arsenate. From 4 to 10 pounds in 50 gallons of water, applied with hand sprayers, were used per acre. Considerable airplane dusting was done for leaf worms in the Delta of Louisiana, Mississippi, and Arkansas, and in Texas. Calcium arsenate, or calcium arsenate to which 5 to 20 percent of paris green had been added, was generally used and gave satisfactory control. Several hundred acres were also dusted with calcium arsenate by airplane in Arizona.

Effect of calcium arsenate on certain soil types.--F. H. Tucker, State College, Miss., has submitted a progress report on the effect of calcium arsenate on certain soil types extensively used for cotton growing in Mississippi. Seven of the principal types were placed in concrete "bins" 3 by 16 by 1 foot, open at the bottom, and treated with calcium arsenate at the rates of 50, 100, 200, 400, 800, and 1,600 pounds per acre. Cotton, corn, and soybeans were grown on each plot during the summer and cover crops during the winter. Samples of soil were taken for analysis on May 14, 1935, 6 weeks after the calcium arsenate had been added, and again on July 16, 1936. During the 14-month interval the water-soluble arsenic had decreased from 23 percent to 74 percent in the different soil types receiving from 50 to 200 pounds per acre and from 40 percent to 80 percent in the plots receiving 400 to 800 pounds per acre. The average change in water-soluble arsenic in all soil types was from 6.3 to 2.6 parts As_2O_5 per million of soil in the plots receiving from 50 to 200 pounds of calcium arsenate and from 187 to 64 ppm of As_2O_5 in the plots receiving 400 to 1,600 pounds per acre, or 58 percent and 65 percent, respectively. The greatest relative changes were in the Norfolk and Sarpy types from the hill and Delta sections of the State, respectively. The least changes were in the Houston (northeast prairie) and Cahaba (northeast highland) types. The reduction in water-soluble arsenic in the Norfolk sand is of interest because it is one of the types that showed heavy damage to crops. It is probable that the arsenic was carried out with the drainage water or seeped below the sampling level. The crop yields obtained on the concrete plots in 1935 and 1936 were not satisfactory because of their small size. The extremely dry condition at planting and throughout the season in 1936 also affected the fields so greatly they are not considered reliable. Delay in germination was evident, however, on the plots receiving the heavier dosages of calcium arsenate in both years. In field plots planted to cotton in 1935 on Ruston, Memphis, Sarpy, and Houston types the yield was reduced only on the Ruston plots where 200 or more pounds of calcium arsenate per acre were added. The Ruston plots were replanted to cotton in 1936 and yields were reduced on the plots with 400 and 800 pounds per acre and no cotton was produced on the 1,600-pound plot. The indications are that the plot which received 200 pounds per acre is recovering.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Gin-trash inspection.--Intensive gin-trash inspections were continued in the Western Extension of Texas during the first 2 weeks of November, at which time a freeze was experienced in that area. This greatly lowered the efficiency of inspection and, in view of the large amount already done, inspections were discontinued. No additional specimens of the pink bollworm were found. A machine was operated in Lower California and another in Sonora, Mexico, without finding any infestation. In the Tucson area of Arizona a machine was operated for about 2 weeks without finding any specimens of the pink bollworm; however, 25 specimens of the Thurberia weevil were found. At the end of November gin-trash inspection had been completed in all areas except the Salt River Valley of Arizona. Two machines are operating in this area and will complete the season in about 2 more weeks.

Field clean-up in the Big Bend of Texas.--The cleaning of cotton fields in the Big Bend area of Texas to help control pink bollworm infestation got under way during the month. In many cases farmers had not completed picking, and for this reason it was necessary to use only small clean-up crews. By the end of the month picking was completed to the extent that plenty of acreage was available for cleaning. As a rule the most heavily infested fields are being cleaned first. Stalks have been cut on 932 acres and the debris raked up on 375 acres. There has been considerable damp weather, which has prevented stalks from drying out very fast and, as a result, material has been burned on only 126 acres.

Wild cotton eradication.--The eradication of wild cotton in southern Florida was continued with W. P. A. funds until November 7 and since that time it has gone forward using Bureau funds. Extremely heavy rainfall during the summer months has resulted in all vegetation making very rank growth, and in many cases old trails which have been cut had grown up so that it was necessary to almost cut new trails to reach the plant colonies. An effort has been made this season to reclean colonies before seedlings reach the fruiting stage. This naturally results in the work going forward more slowly than usual, as the small plants are harder to locate. Notwithstanding the above difficulties, the work has made very good progress. During the month colonies covering some 3,000 acres were recleaned, and 516 mature, 118,079 seedling, and 3,135 sprout plants were removed. Several small colonies were located and cleaned for the first time. They covered only about 8 acres and consisted of 78 mature and 196 seedling plants. Toward the close of the month the Cape Sable area had dried out considerably and steps were being taken to reestablish the camp there.

Thurberia-plant eradication.--The eradication of Thurberia plants in the Santa Catalina Mountains of southern Arizona has made very good progress. During the first half of the month part of the laborers continued working out from Tucson, but during the latter half of the month all of the laborers worked from Camp Lawton. In this latter section it was necessary to cover a considerable area in which no plants were found, as there was no definite information as to the altitude above which plants would not grow. The highest altitude at which plants have been found since this work got under way is 5,600 feet. During the month 7,835 acres were gone over and 9,073 Thurberia plants were destroyed.

Road-station inspection.--During November, 11 interceptions were made from the 1,057 cars inspected at the Marfa, Tex., road station. Most of the interceptions consisted of small lots of seed cotton and 6 of them were found to be infested with the pink bollworm, 45 living larvae being taken. One interception was of particular interest. It consisted of 84 locks of seed cotton found between the bed and cab of a truck. From this material 28 living larvae were taken, 8 of which were in the lint and the remainder in seed. To date 15 infested interceptions have been made and 73 living and 18 dead larvae of the pink bollworm were taken. In most instances the infested interceptions were made from trucks that go back and forth between Marfa and the Big Bend. Truck drivers have been requested to clean their trucks before leaving the Big Bend, and the few interceptions made indicate that they are making an effort to do so. The fact that a few locks of seed

cotton are found in some of the trucks further indicates that the road-station inspectors are efficient in their work.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Rotenone dusts give promise in control of pea weevil.--T. A. Brindley, of the Moscow, Idaho, laboratory, reports that as a result of large-scale field tests during the 1936 season, dust mixtures containing 1.0 or 0.5 percent rotenone, with finely ground diatomaceous earth, tobacco dust, or sulphur as diluents, reduced the infestation by Bruchus pisorum L. more than 99 percent, on an average, in green peas harvested for canning and in dry peas harvested for seed or processing, as compared to the pea weevil infestation in untreated plots. These dust mixtures gave results superior to treatments with undiluted cryolite, calcium-arsenate-sulphur (1-5), or paris green-lime (1-5). Five treatments were applied to these experimental plots at a dosage of 20 pounds per acre per application, with the exception of the plot treated with the dust mixture containing 0.5 percent rotenone in diatomaceous earth, which received 40 pounds per acre per application. In the untreated plots, on an average, approximately 43 percent of the peas were infested by the pea weevil.

Canned peas treated with derris show no derris constituents.--In experimental work in which derris has been used for combating the pea aphid, a question has arisen regarding the possible contamination of the canned peas from plants treated with this insecticide. In order to obtain data on this problem, R. A. Fulton, of the Columbus, Ohio, laboratory, recently analyzed canned peas that had been treated by dusting or spraying with derris, at the dilutions found to be effective in the control of Illinoia Kalt. The canned peas were subjected to chemical treatments to remove any traces of the active ingredients of derris contained therein. The resulting product was then tested for the presence of rotenone or other derris derivatives through the medium of the goldfish method and also by colorimetric analyses. In six analyses no trace of derris constituents could be detected in any of the peas that had been removed from treated plants.

Nicotine peat ineffective against cabbage worms.--C. E. Smith, of the Baton Rouge, La., laboratory, reports that in field experiments to obtain data on the possible value of nicotine peat moss dust in controlling the more common species of cabbage worms, including principally the cabbage looper (Autographa brassicae Riley) and the imported cabbage worm (Ascia rapae L.), this material proved to be distinctly inferior to derris dust mixtures containing 1.0 and 0.5 percent rotenone, respectively, and also inferior to a specially prepared undiluted calcium arsenate.

Dilutions of dichloroethyl ether effective against wireworms will not kill lima bean plants, tests indicate.--M. W. Stone, of the Alhambra, Calif., laboratory, reports that in preliminary experiments to determine the effect of dilute solutions of dichloroethyl ether on growing lima beans, it was found that this material at concentrations of 1, 3, and 6 cc, respectively, per gallon of water, applied at the rate of 100, 200, and 300 cc, respectively, to lima beans grown in 6-inch flower pots, did not retard the growth of

the lima beans. There was, however, a slight retardation of growth when using the dichloroethyl ether at concentrations of 9 to 12 cc. Since field applications directed against the sugar beet wireworm (Limonius californicus Mann.) and associated species showed that a 94-percent kill of these pests could be obtained when using dichloroethyl ether at a concentration of 5 cc in 1 gallon of water per 15 linear feet of row, it appears that it will be possible to consider seriously the direct application of the dichloroethyl ether solution to the main crop in the field in combating wireworms instead of planting trap rows of the host plant, intended for ultimate destruction during the process of treating such trap rows to kill the wireworms.

Status of beet leafhopper parasites varies with host-plant association.--C. F. Henderson, of the Twin Falls, Idaho, laboratory, reports that in a dissection of approximately 5,000 females of Eutettix tenellus Bak. collected on Russian-thistle during the progress of a fall survey in Idaho 38.3 percent of them were found to be parasitized by Pipunculus subnitens Cress. In collections of E. tenellus females made from sage growing in areas adjacent to the Russian-thistle, an average of 22.5 percent of the dissected females in approximately 2,500 dissections were found to be parasitized by P. subnitens. It is thought that the difference between the percentage of parasitization in Russian-thistle areas as compared to the adjacent sage areas can be explained on the basis of the inability of the parasitized E. tenellus females to move as readily from Russian-thistle to sage as did the unparasitized individuals.

Celery leaf tier not abundant in Florida.--C. B. Wisecup, of the Sanford, Fla., laboratory, reports that Phlyctaenia rubigalis Guen. is practically nonexistent in the Sanford area during the current crop season. Field searches have disclosed but two moths, and no signs of larvae. This scarcity of leaf tiers may be attributed to a number of factors. Seed beds were late, and the stand of plants sparse, so that all beds having large plants were pulled over very heavily by October, leaving a very poor and uninviting cover in which the P. rubigalis moths could hide. It is evident that if the moths came into the areas as expected, they had very few suitable locations in which to settle. In addition, the unusual abundance of the garden flea hopper (Halticus citri Ashm.) caused practically every grower to dust his seed beds regularly with pyrethrum. It seems reasonable that this repeated dusting would destroy any brood of the celery leaf tier attempting to become established in the seed beds. Owing to continued dry weather, the native vegetation has been very sparse and tended to dry up early, so that it would have been unsuitable for developing a brood of celery leaf tier.

INSECTS AFFECTING MAN AND ANIMALS

Phenothiazine shows promise as preventive of screwworm infestation.--H. E. Parish and J. T. Bigham, of the Menard, Tex., laboratory, have obtained the following results in tests of various materials for preventing reinfestation of screwworms in range livestock. Each of the materials was applied every 2 days until wounds had healed, to animals suffering a natural screwworm infestation.

Material tested	Cases : treated	Average re- : infestations : per case	Average days : case required : to heal
	Number	Number	Number
Pine-tar oil-----	162	.72	23.4
Bone oil-----	87	.68	25.9
Pine-tar oil 85 percent, powdered : derris 15 percent-----	66	.27	26.2
Pine-tar oil 85 percent, naphthalene 15 percent-----	66	.64	24.8
Phenothiazine-----	110	.25	21.9

Wettable sulphur effective in control of goat louse.--The demonstration work on the use of a wettable sulphur dip for the destruction of goat lice carried on by O. G. Babcock on several ranches in New Mexico and Texas has elicited many reports from ranchmen and county agents on the excellent results obtained with this material. One ranchman of Lake Valley, N. Mex., writes: "There are no lice present on dipped animals and none were found at time of fall shearing, September 30, the first time I have had my herd clean of lice. The sulphur dip, to my mind, is superior to any dip I have ever used, both in killing the lice at time of dipping and in keeping the goats free from the pests for several months afterward." County agent Paul Brown of Lordsburg, N. Mex., reports: "One ranchman said that his goats yielded approximately one quarter more hair as a result of the dipping." The county agent of Bosque County, Tex., reporting on an examination of a flock of goats that had previously been treated with the sulphur dip, states: "At this time the goats showed a pronounced increase in oil and lustre in the fleece, appeared more thrifty, and had put on weight. No lice were found on any of the goats inspected at this time."

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Three living larvae of the West Indian fruit fly (Anastrepha acidusa Walk.) were collected on July 3, 1936, in cashew (Anacardium occidentale) in the field at Dorado, P. R. Three larvae of the Mediterranean fruit fly (Ceratitidis capitata Wied.) were intercepted at Boston on October 26 in a pear in ship's stores from Greece. A living larva of the pyralid Morpheis smerintha Hbn. was taken at Laredo, Tex., on August 23 in a bamboo stalk in baggage from Mexico. The coccid Asterolecanium miliaris longum Green arrived at Washington, D. C., on March 12 on dried bamboo leaves in the mail from St. Kitts. Sixteen living larvae of the turnip gall weevil (Ceutorhynchus pleurostigma Marsh.) were taken at Norfolk, Va., on October 8 in turnips in stores from Denmark. A living specimen of Orchidophilus gilvotatus (Barber) was intercepted at San Francisco on August 10 in an orchid, Phalaenopsis amabilis, in cargo from the Philippines. This weevil was formerly known as Ceutorhynchus gilvotatus Barber. A living larva of Curculio venosus Grav. arrived at Chicago, Ill., on October 23 in an acorn in the mail from England. An adult of this weevil was intercepted at Boston in 1926 with chestnuts in cargo from Italy. Living specimens of Platythrips tunicatus Hal. were taken at New York on August 18, 1936, on heather in the mail from Scotland. Living larvae of the chrysomelid

Psylliodes chrysoccephala L. were found at Baltimore, Md., on August 31 in turnips in ship's stores from England. A living specimen of the coccid Steingelia gorodetskia Nass. was intercepted at Honolulu, Hawaii, on March 19 in packing material for Aster cordifolius in the mail from England. A living specimen of Cicadella jucunda Walk. arrived at Charleston, S. C., on June 25 with banana debris in cargo from Honduras. Living specimens of Anaphothrips orchidaceus Bagn. were intercepted at the airport at Brownsville, Tex., on May 6, 9, and 16 on orchids in cargo from Mexico. J. C. Crawford reports that this thrips was originally described from England on orchids in greenhouses. Tropical America is probably the original home.

Correction.--In the December 1, 1936, NewsLetter (vol. 3, no. 12) the family of Orthaea servillei Guer., mentioned on page 25, line 14, should be Lygaeidae.

Straw jackets around liquor harbors bruchids.--In making the usual inspection in connection with the packing-material quarantine at New Orleans, rye-straw jackets used as packing in cases of Benedictine were found to be contaminated with a small amount of narrow leaf vetch (Vicia angustifolia), consisting of stems, seed pods, and seed. The New Orleans inspector who examined the packing material found several living specimens of Bruchus luteicornis Illiger in the seed pods and straw jackets. This bruchid is not known to occur in the United States.

Melon fly pupae intercepted in sphagnum moss packing.--A collaborator of this Bureau at the port of San Francisco found 14 pupal cases and dead pupae of the melon fly (Bactrocera cucurbitae Coq.) in sphagnum-moss packing around the roots of young palm trees arriving from the Hawaiian Islands by express. This interception serves to illustrate again the unexpected manner in which certain pests may arrive at our ports. In this instance the insects were dead, but there is always the possibility that living pests will find entrance in a similar manner.

Collect ample material.--Among the foliage and stems of a quarter of a pound of parsley in stores from France a New York inspector found six specimens of thrips. These were determined by J. C. Crawford as Anaphothrips obscurus Mull. (2), Thrips tabaci Lind., Frankliniella intonsa (Tryb.), Thrips fuscipennis Hal., and Taeniothrips atratus Hal. Sometimes it pays to take all specimens possible rather than be satisfied with only one or two.

Balsa wood infested.--Balsa wood imported at New York and believed to be from Ecuador was found to be infested by an airplane-model manufacturer who turned three specimens of the insect over to one of the inspectors at Boston. The insect has been determined by Grace A. Sandhouse as Xylocopa transitoni Perez.

Bulging purses under suspicion.--Stateroom inspection of a vessel from Mexico by a New Orleans inspector revealed soil in a discarded shoe box. Two discarded plants were found in the stateroom but none in baggage and the passengers declared they had no plants; however, examination of the contents of the ladies' bulging purses disclosed three dwarf begonia plants and one cactus, all potted in soil.

Another overburdened purse.--A couple claiming to be from California and fully informed as to plant quarantines made sure they could bring back their dog before taking it to Mexico. Returning 10 days later they claimed to have no plant material. The Laredo customs inspectress insisted on examining the lady's purse, however, and found two oranges in it. In the meantime the plant quarantine inspector had found potatoes and apples concealed in various places in the car. The woman said she would not pay her fine but would go to jail, but her husband paid the fine and apologized for her behavior.

Cook found guilty.--"Mango Mike" is a cook in the dining car of the Missouri Pacific Railroad operating between Mexico City and San Antonio, Tex. The United States customs inspectors board the train at Laredo, Tex., and inspect the train and the passengers' baggage en route to San Antonio. On one trip the inspector picked up a mango seed, on another trip he found a mango in the cook's pantry, and the evidence all pointed to Mike as being the guilty person. On a third trip mangoes were found in a fruit jar hidden under the fish and ice. The inspector took the mangoes and Mike to the chief steward and said: "This is the third time I have found mangoes or evidence of mangoes in Mike's kitchen and he has to pay a fine or something will be done about it." The steward said to Mike: "Get your things off the car at San Antonio; you are being put on the ground for 30 days." At the end of 30 days Mike was back in his kitchen and declared he hadn't really missed any meals, but had postponed a few, and that his craving for mangoes was entirely cured.

Pathological interceptions of interest.--Ascochyta pisi Lib. was intercepted from Hungary for the first time September 26 in hairy vetch seed in cargo at New York. Ceratostomella fimbriata (E. & H.) Ell. was intercepted on carrot from England October 27 at Port Arthur (see News Letter vol. 3, no. 12, p. 26, December 1, 1936). Our first interception of Cercospora nicotianae Ell. & Ev. was made at New York on November 23 in tobacco leaves in stores from Haiti. Cercospora petroselinii Sacc. was intercepted for the first time on November 19 at Philadelphia on parsley from Morocco. An undetermined species of Ascochyta was found on the same spots. Cylindrosporium chrysanthemi Ell. & Dearn. was intercepted for the first time on November 21 at Brownsville on chrysanthemums from Mexico. Gloeosporium melongenae Ell. & Hals. was intercepted from Europe for the first time on November 5 on eggplant from Italy. Our first interception of Gloeosporium musarum Cke. & Mass. from Brazil was made on November 25 at Boston. Our first interceptions of Mycosphaerella shiriana Miy. were made on October 9 and November 10 at New York on rice hulls from Japan. A fungus of the Myxosporium and Gloeosporium type was found on spruce cones from Germany at New York on October 8. Specialists have been unable to find any species description, in either genus, that agrees with the material. Phragmidium disciflorum (Tode) James was intercepted for the first time on November 4 on a rose from England at Washington. Our first interception of Septoria primulae Buch. was made at Norfolk on November 5 on a primrose from England.

Correction.--The new generic name for Anguillulina tritici (Steinbuch) Garv. and v. Ben. was erroneously given as Ditylenchus in the last News Letter (vol. 3, no. 12 p. 26, December 1). The new combination for this species is Anguina tritici (Steinbuch) Filipjev.

DOMESTIC PLANT QUARANTINES

Standardization of State plant quarantines recommended.--The national conference of State quarantine officers at a meeting held in Chicago on November 5 and 6 passed resolutions recommending that each regional plant board appoint a committee to review the State quarantines and to recommend to the National Plant Board changes that will accomplish uniformity within the group of States comprising the regional board. Further, that the national board, after studying the data of the various committees, recommend such changes in existing quarantines as are needed to bring about complete uniformity on the part of all States. The conference further recommended that the Bureau make adequate annual surveys of pests under quarantine, or those which may be placed under quarantine, and provide the States each year with information as to the areas affected.

Post Office Department recognizes State quarantines.--Through an amendment to postal regulations, provision has been made for postmasters to turn back to senders packages of plants or plant products shipped in violation of State plant quarantines. This service is available to States that have arranged for the terminal inspection procedure. The postal amendment, approved on October 15, also provides for the issuance of appropriate instructions to postmasters to prevent the acceptance of certain plants and plant products when presented for mailing in violation of such State quarantines or regulations. This is in line with the amendment on June 4, 1936, to the Federal law, extending the provisions of terminal inspection to State plant quarantines.

Peach mosaic work.--Over 50 percent of the California growers having peach mosaic diseased trees on their properties who have been contacted have voluntarily agreed to eradication and have signed releases to this effect, and the work of removing these diseased trees is going forward, with the employment of 78 persons. Full cooperation has been extended by growers in the eradication areas in Colorado and Utah. Forty-six persons are employed in Colorado, removing the infected trees found in the inspection work during the field season.

Citrus canker activities.--All the citrus-growing areas of Texas, including the Winter Garden, Laredo, and Falfurrias districts, have been covered in recent weeks by systematic and thorough inspections for citrus canker. The work is again being centered around the known infected areas of the Houston-Galveston-Beaumont district, to reinspect the few remaining citrus plantings, principally of the satsuma type, and to remove any seedlings or sprouts that have appeared on eradication areas. In Mississippi and Alabama work is centered on the tier of three southern counties in each State where large numbers of abandoned trifoliate bushes abound as the rootstock of satsuma plantings, now dead, and in pecan groves, pine stands, old nurseries, fields, and swamps. Careful inspection has resulted in finding no

canker in either of these States. Approximately 100 men are employed in each State and they have removed over 700,000 worthless trees in Mississippi and over 1,000,000 in Alabama. Inspection and eradication is also continued throughout all areas in Louisiana in which citrus is found.

Phony peach emergency funds increased.--A further allotment has been provided from emergency funds sufficient to continue eradication activities in all affected States during December and January. During the life of the project, dating from August 1935 to the close of October 1936, over 48 million worthless peach trees have been removed from 11 infected States. In Louisiana the work of removing approximately 5,000 diseased trees is being completed by the middle of December.

Mississippi revises phony peach disease quarantine.--Hand culling of peach borer infested trees is no longer a condition under which peach and nectarine nursery stock may be certified for entry into 17 counties in Mississippi, under a revision of the phony peach disease quarantine of that State, which became effective on October 4. These counties were recently established as an eradication area in the campaign against the disease in that State, and no host trees may be shipped into these counties unless they have been produced in a county in which the disease has not been found or in a nursery, the environs of which have been inspected and no such disease found within a mile thereof. Nursery stock from which peach borer infested trees have been removed may be shipped to points in Mississippi outside the eradication area.

M. J. Kelly assigned transit inspection post.--Michael J. Kelly, of the Japanese beetle inspection force, has been placed in charge of transit inspection activities in the Northeastern States, with headquarters at New York City. Mr. Kelly has had several years' experience in the Department.

"Laundry" label used on restricted plant materials.--Uncertified hemlock and laurel wreaths shipped in a carton bearing the declaration of "laundry" and moving by express from the gypsy moth infested area in Massachusetts to a point in Kentucky, were recently intercepted by transit inspectors at Cincinnati. The signature of the shipper, who was obviously attempting to evade either the classification rates or the quarantine regulations, was illegible; however, his identity can be determined from the local address.

Mexican fruit worm quarantine regulations revised.--Regulation 7 of the Mexican fruit worm quarantine was revised effective November 16, providing authority for the Chief of the Bureau to make such modifications as may be considered necessary as to the duration of the period during which no host fruits are permitted to develop in groves or exist in the regulated area. The purpose of the revision is to facilitate the prompt modification of the host-free period in the event a fruit-fly infestation should be found.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Another European weevil in the United States.--W. J. Brown, of the Canadian Entomological Branch, recently submitted several specimens of a weevil collected in Nova Scotia and New Brunswick in 1936. These have been identified by L. L. Buchanan as the European Trachyploeus bifoveolatus Beck. Although not recorded heretofore from North America, this species has been present in New York State for a considerable period. Specimens in the National Museum collection from Barneveld, N. Y., in 1919, and others from Oriskany, N. Y., in 1931, had been identified as T. davisi Blatchley, a species first described in 1916 from Staten Island, N. Y. In the absence of authentic examples of T. davisi, its status is somewhat uncertain, but published statements indicate that davisi Blatchley 1916 is not a synonym of bifoveolatus Beck 1817.

Valuable collection of fruit-fly material from Africa.--In connection with the fruit fly investigations in Africa conducted by the Bureau during the past year, an exceptionally fine lot of Trypetidae was collected by Fred A. Bianchi and Noel Krauss and referred for identification. C. T. Greene has studied this material, which comprised 1,660 specimens, and reports that of these 1,216 belong in the genus Ceratitis and represent 12 species. Seven of these species, four of them undescribed, are new to the National Museum collections. There were 431 specimens of the genus Dacus (including Tridacus), representing 13 species, of which 5 are new to science and 12 not previously contained in the Museum collection. Large series of excellent specimens in the case of a number of species both in Ceratitis and Dacus will greatly facilitate the critical study of these groups. Included with the material belonging to these genera were 13 specimens of miscellaneous Trypetidae representing 7 other genera and including 8 species new to the collection, of which 2 are undescribed. Additional trypetid material collected by R. H. Van Zwaluwenburg, also in Africa, has not yet been worked over in detail but is certain to contribute more valuable specimens to the national collections of this group.

Habits of a phytophagous chalcid.--Recently A. B. Gahan identified as Bepirate maculicollis Cam. specimens received for determination from A. P. Troconis, of Maracay, Venezuela. A letter accompanying the material stated that this chalcidoid attacks the very young fruit of Anona muricata. The egg is deposited within the individual seed or nut. Before the seed is mature the completely developed insect perforates the cuticle of the seed and emerges through the surrounding fleshy tissue, appreciably injuring the fruit. These observations seem to be the first that have been recorded on the habits of this species.

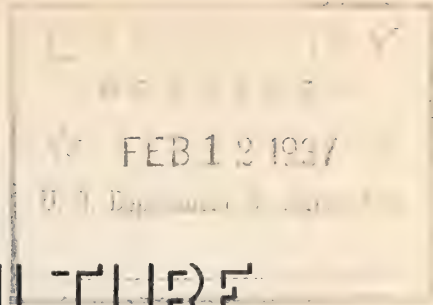
Occurrence in the United States of a Japanese parasite of Comstock's mealybug.--Specimens reared from Pseudococcus comstocki Kuw. by R. N. Jefferson, at Blacksburg, Va., have been determined by A. B. Gahan as the encyrtid Clausonia purpurea Ishii. This species was originally described from Japan and was not previously known to occur in the United States, although an apparently unsuccessful attempt to introduce it into California was made in 1916.

Rediscovery of a species of Cicadellidae.--A specimen, in excellent condition, determined by P. W. Oman as Neocoelidia barretti Baker, was found in banana debris from Mexico at Brownsville, Tex., on November 13 by J. M. Singleton, of the Division of Foreign Plant Quarantines. Although N. barretti was described in 1898 from two specimens, which are now in the National Museum, this appears to be the first authentic collecting record for the species since its description.

Records of new aphids from port interceptions.--Four species of aphids, all determined by P. W. Mason as apparently representing new species of the genus Kakimia, have been received for determination with material intercepted by the Division of Foreign Plant Quarantines during the past summer. Two of these were on saxifrage, one on lettuce, and one on Sempervivum. According to available records, species of Kakimia usually live on the Saxifragaceae. Lettuce and Sempervivum in the above cases were probably secondary hosts.

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UNITED STATES
DEPARTMENT OF AGRICULTURE



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NEWS LETTER

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FRUIT INSECT INVESTIGATIONS

Covering raisins reduces insect infestation.--Further evidence of the effectiveness of covering boxed raisins with shade cloth after cleaning them with a motor-driven shaker screen was obtained by H. C. Donohoe, of the Fresno, Calif., laboratory. Seedless raisins produced in three vineyards were screened and stored in boxes out-of-doors on the ranches for about 1 month. A part of each crop was covered only by a loose shield of trays to keep out rain; another portion of each lot was covered in the same way and then protected from insects by a sheet of shade cloth. The results, estimated from infestations found in samples of the raisins, were as follows:

Protection	Average infestation per ton by--		
	Raisin moth ¹	Indian-meal moth ²	Total
After drying, before screening-----	27,800	800	28,600
Immediately after screening-----	5,400	200	5,600
After storage in unprotected boxes--	--	--	21,700
After storage in boxes covered with shade cloth-----	--	--	1,600

¹/Ephestia figulilella Greg.

²/Plodia interpunctella Hbn.

An outbreak of the grape leaf folder.--Perez Simmons, Fresno, reports that the exceptional abundance of Desmia funeralis Hbn. in several areas in the San Joaquin Valley resulted in considerable damage by larvae, apparently of the third brood. In some vineyards most of the leaves were rolled and fed upon and extensive damage to fruit was observed by H. C. Donohoe during the period from September 24 to October 23. Sample counts of bunches showed damage to 66, 73, and 55 percent. Mr. Donohoe reports that parasitization of the late larvae by Microbracon, based on random counts in several locations, was 15, 69, 6, 24, 77, 99, 99 plus, and 100 percent. The parasite was probably M. cushmani Mues., as 15 specimens from one locality were all of that species. There was evidence that applications of calcium cyanide, put on by owners, had failed to control Desmia and had reduced parasite attack on the larvae. Two estimates of the population of pupae in leaves on

the ground (October 15 and 23) gave 287,000 and 331,000 per acre. Parasitization of pupae by six or more species as yet not determined was 46.0°, 6.0°, and 1.5 percent. An attempt made by Mr. Donohoe to kill the pupae by burning the fallen leaves with a portable weed burner, using kerosene as fuel, was not successful. Applications of dichlorethyl ether solutions to the pupae, by Dwight F. Barnes and Charles K. Fisher, gave poor results when 5, 10, and 20 cc per gallon of water and 2 gallons of solution per square yard of soil were used.

Tree protectors not fully effective against peach borer.--Oliver I. Snapp and J. R. Thomson, Jr., of the Fort Valley, Ga., laboratory, have just completed the season's work with protectors to prevent Conopia exitiosa Say from entering peach trees. They report that neither the cotton-batting protector held snugly in place with screen wire nor the tar-paper cone sealed with tree tanglefoot prevented just-hatched peach borers from entering peach trees. These were the two most promising types of protectors used in the extensive tests of 1935. Twelve of the fourteen types of protectors tested in 1935 did not prevent just-hatched peach borers from entering peach trees. The results of the work with tree protectors during the last 2 years lead to the conclusion that there is very little possibility of developing a protector that will give 100-percent protection against the peach borer. This is due to the fact that just-hatched peach borer larvae will bore into the bark above a collar that may be a foot above the soil level and work down under the bark to the base of the tree if the collar extends that far; they may come out underneath the collar if it is only several inches wide and then crawl down the trunk under the protector to the base of the tree; or they may gain entrance to protected trees through cracks in the soil around the base of the protector.

Field tests with Japanese beetle repellents.--W. E. Fleming and F. E. Baker, of the Moorestown, N. J., laboratory, have completed a report on large-scale field tests, made during the 1936 season, of materials used for the protection of early ripening peaches and apples from injury by the adult Japanese beetle. Various combinations of derris were tested to ascertain whether any more satisfactory combinations than the derris-rosin residue emulsion combination now recommended could be developed. It was found that the derris-rosin residue combination was equally as good, if not superior to, any other derris combination for protection of early ripening peaches. For use on apples the lime-aluminum sulphate combination, as now recommended, was found to be the most satisfactory, and a single application at the beginning of the season was as effective as a double application.

Hibernation of Japanese beetle larvae.--T. N. Dobbins, Moorestown, reporting on the entrance of Japanese beetle larvae into hibernation, found from surveys made during December a decided decrease in the proportion of larvae entering hibernation in the second instar, and a corresponding increase in the number of larvae entering hibernation in the third instar, as compared with a year ago. About 10 percent of the present soil population will enter hibernation in the second larval instar, whereas a year ago (winter of 1935-1936) approximately 25 percent of the soil population entered hibernation in this instar. This condition is apparently

due to the fact that soil temperatures during the fall of 1936 were, in general, somewhat higher than temperatures during the same period in 1935.

MEXICAN FRUIT FLY CONTROL

Status of project at the close of 1936.--Fruit shipments for the 1936-37 season from the lower Rio Grande Valley exceeded 7,100 cars by the end of December. This is approximately twice as much fruit as was shipped during the same period last season and is well in advance of any previous year. Eleven adult A. ludens Loew were trapped on 11 premises during December. The total number of adults trapped during this season is somewhat below that of 1935-36. The results of the project's activities for the month of December are summarized in the following table.

Item	December 1-15	December 16-31
Groves inspected-----	6,916	6,852
Premises trapped-----	300	304
Traps operated-----	5,736	5,761
Trap inspections made-----	9,815	13,388
Carloads released-----	1,027	950
Trucks released-----	2,725	2,840
Alternate host-fruit trees destroyed-----	1	3
Premises cleaned of host-fruit trees-----	1	2
Violations:		
On part of grower-----	2	10
On part of packer-----	1	10
Percentage of crop shipped-----	22	33
Approximate price per ton of fruit:		
Grapefruit-----	\$8.50	\$8
Oranges-----	15.00	14

The numbers of fruit flies submitted for identification and the source of capture were as follows:

Species	Texas		Mexico	
	Dec. 1-15	Dec. 16-31	Dec. 1-15	Dec. 16-31
<u>Anastrepha ludens</u> Loew-----	4	7	1	1
Premises-----	4	7	1	1
<u>A. serpentina</u> Wied-----	7	9	0	0
Premises-----	7	9	0	0
<u>A. acidusa</u> Walk-----	2	3	0	0
Premises-----	2	3	0	0
<u>A. sp. "Y"</u> -----	3	1	0	0
Premises-----	2	1	0	0
<u>A. sp. "X"</u> -----	--	1	--	0
Premises-----	--	1	--	0
<u>A. pallens</u> Coq-----	88	21	0	0
Premises-----	50	20	0	0
<u>Toxotrypana curvicauda</u> Gerst-----	5	1	0	0
Premises-----	5	1	0	0
<u>A. sp. Seg. 3</u> -----	--	1	--	0
Premises-----	--	1	--	0

During the period from December 1 to 15 no larvae were taken in Texas but 117 larvae of A. ludens and 20 larvae of A. striata Shin. were taken in Mexico, all in market fruit. No larvae were taken during the period from December 16 to 31 in either Texas or Mexico.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Outbreak of corn earworm on wheat.---Severe damage to wheat by the corn earworm in the vicinity of Stockton, Kans., was observed early in October by H. H. Walkden, of the Manhattan, Kans., laboratory. It is believed that this outbreak on wheat is unique in the history of this species in the United States. A preliminary examination of the literature failed to disclose any records of injury to wheat in America, although the corn earworm is recorded as a pest of young wheat in Australia. Near Stockton approximately 300 acres of stubbled-in wheat was damaged, particularly in weedy areas in the fields where the predominating growth was pigweed (Amaranthus sp.). Evidently the adults had been attracted to the weeds at oviposition time, inasmuch as these were probably the only green plants present at the time the moths were depositing eggs. The larvae had stripped the foliage of the weeds and were forced onto the wheat by lack of food. It was apparent that the wheat was unpalatable and unsatisfactory as a food supply, as the larvae did not consume the plants but either ragged the leaves or bit off the plants at the soil surface where they were left uneaten. The larvae were much smaller than usual and adults which have been reared have only about half the normal wing spread.

Interesting food habit of false wireworm adults.---Mr. Walkden also reports that on September 21, 1936, in a stubble field near Meade, Kans., large numbers of false wireworm adults (Eleodes spp.) were observed congregated on the mounds of the red harvester ant. The ant hills were scattered

throughout the field and on each of them the Eleodes beetles could be seen in great abundance. On closer examination, it was found that these beetles were devouring seeds that had been dropped here and there in the sand composing the mound. On several occasions, an ant returning to the nest with a seed would be set upon by a number of the beetles and robbed of its load of food. The ant promptly dropped its seed and attempted to defend itself by biting at the legs of the beetles; however, the colony in general was apparently not disturbed by the presence of the beetles. On September 22 very few beetles could be found in this field, but on October 8, near Stockton, Kans., Eleodes adults were observed about the ant hills stealing seeds from the ants in the same manner as had been observed at Meade.

Oxygen as a factor in vacuum fumigation.--R. B. Cotton, Geo. B. Wagner, and H. D. Young, Manhattan, report that in vacuum fumigation the susceptibility of insects to fumigants increases with the decrease in pressure. That this increase in susceptibility is due to oxygen deficiency and not to the difference in pressure was demonstrated by the following experiment. In a vacuum fumigation vault of 357.5 cubic foot capacity it was determined that, with an absolute pressure of $2\frac{1}{2}$ inches and an air temperature of 64° F., a dosage of 10 pounds per 1,000 cubic feet of a 9-to-1 mixture of ethylene oxide and carbon dioxide gave a 100-percent kill of adults of the flour beetle (Tribolium confusum Duv.) with an exposure of 1 hour. A test was then conducted in the same vault at the same pressure, but with a different oxygen content. The air was pumped from the vault until an absolute pressure of $1\frac{1}{2}$ inch was obtained. Pure oxygen was then introduced into the tank until an absolute pressure of $2\frac{1}{2}$ inches was obtained. Under these initial conditions exposure for 1 hour to a dosage of 10 pounds per 1,000 cubic feet of space of a 9-to-1 mixture of ethylene oxide and carbon dioxide at a temperature of 67° gave no kill of adult flour beetles. In both experiments the absolute pressure, the quantity of fumigant, and the length of exposure were the same. In the first experiment the oxygen content of the vault was reduced from the normal 21 percent to 1.76 percent, while in the second test the oxygen content was 7.26 percent. The calculations of the oxygen content of the vault in the two tests were based on a barometric pressure of 29.7 inches, which obtained during the first test, and 29 inches during the second test. In the first experiment a slightly larger quantity of nitrogen was necessarily present in the vault but, since this gas is inert, this factor would have no influence on results.

Hessian fly resistance tests at Springfield, Mo.--According to E. T. Jones, Manhattan, of 61 selected strains, principally varieties of fall-sown spring wheat, 18 strains were found resistant to infestation by fall-brood hessian flies. Included in this resistant group are 3 varieties of wheat from Uruguay, 4 selections of Iumillo, 4 selections of Marquillo, 2 selections of Illinois No. 1 B38, Ill. No. 1 x (Norka x Carina), Ill. No. 1 W19, Marvel C.I. 8876, Kubanka C.I. 1440, and Yaroslav Emmer C. I. 1526. Based on 50 plant samples for each strain, the average infestation was 3.8 percent, as against averages of 76 percent for the 43 remaining spring wheats, 70 percent for the Ceres susceptible checks, and 3 percent for the Marquillo resistant checks. The best of this material will be used for developing resistant winter wheat hybrids. This test has also shown Iumillo to be the source from which selections of Marquillo have inherited resistance to hessian fly. The outstanding feature of our Springfield winter

wheat tests is a series of 326 F₅ selections of crosses involving Marquillo and desirable winter wheats--Kanred x Hard Federation, Minturki, Kawvale, Tenmarq, and Oro. Mention of the strong hessian fly resistance of F₃ and F₄ generation selections from which these F₅ hybrids have descended has been made in previous issues of the News Letter. Of the 326 strains, all comparably tested against their parental checks by natural infestation under field conditions in single 8-foot rows, 79 strains have been found to be free from infestation. A total of 235 strains fall within the same infestation range as the 15 Marquillo resistant parental checks, which have an average infestation of only 0.8 percent and a range of 0 to 8 percent. Since the average infestation of the 15 winter wheat parental checks is 84.5 percent and the range of infestation is from 69 to 94 percent, these results are considered highly significant.

JAPANESE BEETLE CONTROL

Certified Christmas plants move in increased volume.--Consistent and widespread demands for inspection and certification of Christmas plants reflected what is reported as one of the best holiday sales since 1929. From practically all districts in the Japanese beetle regulated area come reports of increased sales and complete sell-outs. Potted and tubbed nursery stock for Christmas trees continued to increase in popularity this year. Sales of Norway spruce in tubs showed an estimated 500-percent increase in the Baltimore district. One of the largest greenhouse men in the Philadelphia suburban district stated that the Christmas sales were the best since 1929. Plants shipped from this establishment to points outside the regulated zone during December showed an increase of 5,400 over last year. One large truck load of plants went to North Carolina, and special trains were placed on the nursery siding to handle express shipments on both December 15 and 16. Continuation of mild weather permitted maximum movement of stock. In fact, one New Jersey nursery started its regular "spring" nursery shipping season and moved considerable stock to southern points. Rose plants that ordinarily would not move until spring were shipped from Philadelphia. Shippers of perennial stock have been especially benefited. An upward turn in the wholesale potted-plant and flower business was also noted during the month. Florists in the Hartford, Conn., district reported the largest holiday sales for many years past. One of the largest florists in the city was completely sold out 2 days before Christmas and had considerable difficulty in obtaining additional stock to fill orders. An old established greenhouse at Bristol, Conn., stated that their Christmas sales were within \$80 of the largest holiday sales in their history, which extends back for 76 years.

Gift to Japan certified under Japanese beetle quarantine.--Inspectors from the Trenton, N. J., district office spent considerable time in supervising the digging from lead arsenate treated soil of 50 pin oaks, 3,000 white-flowering and 1,000 pink-flowering dogwoods, 25 weeping dogwoods, 500 magnolias, 25 sweetgum, and 25 rhododendrons for shipment from a large nursery at Princeton, N. J., to the Japanese Government. The shipment was forwarded by members of the Garden Club of America as a token of appreciation for hospitality shown the members on their visit to Japan last year. Selection, packing, and loading of this stock in a special refrigerator car

occupied nearly an entire week. The roots of each plant were wrapped in burlap and moss and the 21 boxes containing the shipment were ventilated in order to keep the cargo fresh during the long voyage. The plants left Princeton on December 27 for Vancouver, where the cases will be loaded aboard the SS Hikawa Maru. Information received indicates that the stock will be distributed among the parks of Tokyo, Nagoya, Osaka, and Kyota. This gift is also regarded as a return expression of good will for the 3,000 cherry trees sent to Washington, D. C., from Japan in 1909.

Carnation cuttings to Sweden and England.--Inspections are being made in the central Pennsylvania district of rooted carnation cuttings for shipment to a classified New York broker who, in turn, is exporting the cuttings to Sweden and Great Britain. It is reported that stock plants of the Laddie variety of pink carnation in these two countries have gradually lost their vitality, and the cuttings are being sent to assist in building up a new stock.

Novelties shipped under gypsy moth certification.--Inspections were made by the Barre, Vt., inspector of a quantity of candy containers manufactured from short lengths of 6-inch branches cut from elm, birch, cherry, poplar, ash, and willow. These 6-inch logs are cut into 3-inch lengths and used by a maple-candy manufacturer at Lyndon, Vt., for her product. The center of the block is hollowed out to form a space 4 inches in diameter and 2½ inches deep. The bark is left intact on the outside. In advertising this product, the manufacturer emphasizes the fact that when the candy is removed the container may be used as a flowerpot. Inspection was also made in the Portland, Maine, district of bundles of kindling and some ornamental white and silver fireplace logs sent by a summer-camp proprietor to his guests. The kindling consisted of finely split pitch pine about 1 foot long, neatly tied with red ribbon into bundles 5 inches in diameter.

Cut of New England Christmas trees reduced.--Fewer Christmas trees were cut in the White River Junction, Vt., district than in any season since such activity began. Approximately 28,000 Christmas trees, 250 wreaths, and 6,500 pounds of boughs were certified for shipment from this district during December. The many truck, parcel-post, and express shipments of trees and mixed greens from scattered localities necessitated considerable travel over icy roads. A similar decrease in the number of Christmas trees shipped was reported from the Keene, N. H., district. A report from Hartford, Conn., illustrates the extent to which the New England cut of Christmas trees has been reduced. Most of the firms dealing in trees in that city this year purchased their stock outside the gypsy moth regulated zone. Many carloads were received from the Provinces of Nova Scotia and Quebec. More balsam than spruce was received from these sources.

Antique houses inspected prior to removal.--In the Swift River Valley of central Massachusetts a territory 18 miles in length and several miles wide is to be flooded by the Metropolitan Water Commission. All buildings and timbers are to be removed and the land cleared. Many of the oldest of the buildings are being purchased by contractors who specialize in colonial homes. After dismantling, the houses are trucked to distant points for

reassembling. Several buildings of this type were inspected at the Quabbin Reservoir by the district inspector at Westfield, Mass. Four new gypsy moth egg clusters were treated on one of the buildings prior to its removal from the restricted zone. The most satisfactory method of inspecting such buildings is to examine them before they are taken down, as any egg masses deposited on the outer surfaces of the lumber may then be easily observed.

District inspectors check truck movement of Christmas trees.--For 12 days prior to Christmas five gypsy moth inspectors whose districts are on the border of the generally infested zone made part-time checks on trucks leaving the area to determine whether any Christmas trees were being hauled from the territory from which trees are not permitted movement. Seven exit highways were covered in this manner. Most of the vehicular inspection was performed from 6 p.m. to 11 p. m., when most of the truck movement would occur. Services of these district inspectors were available for this road work, despite the large amount of extra work during the Christmas holidays because Christmas trees could not be certified for movement from their respective districts.

Enlarged inspection force examines Christmas greenery.--Twenty-three temporary inspectors were employed in the inspection and certification of Christmas trees and mixed greenery moving from the lightly infested gypsy moth area during the Christmas season. Ten extra light trucks were required to transport the inspectors between cutting lots. Sales of wreaths and decorations were reported as in excess of previous years. Shipments of decorative material under certification were much heavier than in 1935. Many tons of balsam boughs and other evergreens were inspected before they were manufactured into finished products for later certification. This greenery was shipped largely to New York, Pennsylvania, Ohio, and Oklahoma.

Infested rails inspected.--Inspection of a carload of scrap rails shipped by the Boston and Maine Railroad's yards at Billerica, Mass., to Franklin, Pa., netted 18 gypsy moth egg clusters. The rails were torn up from abandoned side tracks near Rochester, N. H.

Cumberland, Md., elm-sanitation project completed.--On December 17 a project involving the removal of dead and dying elms in the valley in the vicinity of the tree infected with Dutch elm disease at Cumberland, Md., was completed. This work was carried on in a strip about 4 miles long, stretching from the infection center to Cumberland, about 3 miles, and for a distance of 1 mile beyond the center. The sanitation crews took out approximately 14,000 dead or decadent trees. In adjacent sections where the elms were of some value, 141 trees were pruned. Sixty specimens were submitted for laboratory culture, many of which showed pronounced streaking in the wood; however, none of them have yet cultured Dutch elm disease. Many specimens have been determined as Verticillium.

Seventy-three-inch elm removed.--A difficult eradication was encountered in Rumson, Monmouth County, N. J. The lawn tree involved overhung a walk and shrubbery. It was 73 inches, diameter breast height and 108 inches in

diameter at the butt. Along with many similar traditions, it is claimed that the tree is over 200 years old, and that it is of historical interest because George Washington is supposed to have eaten dinner under it during the Revolutionary War. At the first crotch the tree measured 20 feet in circumference. Conservatively estimated, there were over 2 tons of concrete in cavities, together with a whole system of drain pipes and braces. The eradication required an entire week.

Dutch elm disease eradication personnel.--W. P. A. workers engaged in elm-sanitation and chemical-treatment work at the end of the month numbered 326 in Connecticut, 4,018 in New Jersey, 1,427 in New York, and 68 in areas outside the major infected zone. There were also assigned to this project 60 regularly appointed men, 118 appointed men on W. P. A. funds, 412 C. C. C. enrollees, and 54 State-appointed and per diem men. Eleven of the appointed personnel were assigned as technicians at the Morristown, N. J., Dutch elm disease laboratory.

Scolytus survey completed.--The survey of the Ohio-West Virginia area infected with Scolytus multistriatus Marsh. was completed on December 11. A total of over 600 specimens of beetle galleries and trunk samples was collected for laboratory tests for Ceratostomella ulmi. About 400 have been cultured but no Dutch elm disease fungus has been isolated. The men engaged in this survey returned to activities in the major diseased area.

FOREST INSECT INVESTIGATIONS

Fall webworm outbreak on madrone reported.--K. A. Salman, of the Berkeley, Calif., laboratory, reports that early in August 1936, madrone trees (Arbutus menziesii Pursh.) scattered through the stands of the Tahoe National Forest between Marysville and Camptonville, Calif., were found to be infested by a web-forming caterpillar. The species has since been determined, by rearing, as Hyphantria cunea Drury. Although the insect infests a number of host plants in California, usually it is not abundant in forested areas. The only other record of collection from madrone that is in the Berkeley laboratory files is one made in 1930 by H. E. Burke near Saratoga in the Big Basin area of the Coastal Range.

Bark beetle control maintained in southern California mountain areas.--J. M. Miller, Berkeley, reports that a recent survey of the Idyllwild area in the San Jacinto Mountains indicated that western pine beetle infestation was considerably less than it has been for several years. In the entire tract of some 10,000 acres, the 1936 over-wintering infestation will probably not exceed 50 trees. The private owners in this district, however, are insistent on keeping the area as clean as possible and have made plans for treatment of all infested trees that can be located during the current winter. Under a cooperative agreement, the spotting of infested trees will be carried on by the Forest Service and cost of work will be met by the individual land owners. J. W. Bongberg, who has been on E. C. W. work under the Berkeley laboratory for the past two seasons, will be carried by the Forest Service for the entomological supervision of this project.

Alder flea beetle causes defoliation in camp grounds and resort areas.--Mr. Miller also reports that during 1934 and 1935 alders growing in the canyons of the San Bernardino and Sierra Nevada Mountains were attacked by Haltica bimarginata Say. Complaints were received by the Berkeley laboratory from summer-home owners regarding conditions and requests were made for control recommendations. Apparently few, if any, trees were killed as a result of the defoliations, but the loss of shade and presence of the larvae were quite objectionable to the public. In several resort tracts in Little Canyon, in the San Bernardino Forest, a large percentage of the tourists left the camp ground during the period of larval feeding. At the Arch Rock entrance to Yosemite National Park and at the Merced Big Tree Grove the alders were sprayed with an arsenical formula during the early summer of 1935. This effectively checked most of the defoliation. During the summer of 1936 the infestation of the alder flea beetle was much lighter than during the two preceding years, and very little trouble was reported.

Effect of drought on growth of black locust and survival of locust borer larvae.--R. C. Hall, of the Columbus, Ohio, laboratory, reports that during the winter of 1934-35 a drought shed approximately 1/10 acre in area, was constructed on one of the black locust plantings on a coal "spoil" bank near Hopedale, Ohio. Analysis of the data for 1936 shows a marked decrease in growth, as well as a considerable increase in locust borer survival on the drought area over that on adjacent check areas that received normal rainfall. The average diameter growth at breast height, on the artificially induced drought plot, was 0.146 inches, with a 67.0-percent survival of locust borer larvae, whereas the growth on the check area, which received normal rainfall, was 0.201 inches, with but 26.2-percent survival of larvae.

Lime sulphur as a stomach poison.--S. F. Potts, of the New Haven, Conn., laboratory, reports: "An examination of the laboratory and field toxicity tests on the spruce sawfly (Diprion polytomum Htg.) showed that this species was very easily controlled by a 3-percent mixture of lime-sulphur concentrate applied as a stomach poison. This is of interest, because lime sulphur as a contact insecticide was not effective. It has never been considered a stomach poison. Of numerous insecticides tested previously on the larch case bearer it was the only one that was effective. It is also of interest to note that lime-sulphur stimulated the needle and twig growth of larch trees, and this insecticide, as well as certain oils, stimulated the growth of new white and red spruce needles."

Elm bark beetles.--W. D. Buchanan, of the Morristown, N. J., laboratory, reports on experiments he has conducted with adults of the European elm bark beetle (Scolytus multistriatus Marsh.) and the native elm bark beetle (Hylurgopinus rufipes Eichh.). The purpose of these experiments was to determine the relative number of injuries made by the two species in small elm trees under similar controlled conditions. Part of the work was done in a greenhouse and the remainder in outdoor screened cages. Adults of S. multistriatus made an average of 114 percent more injuries per individual than did adults of H. rufipes, the term "injuries" referring to places where the adults had gone through the bark and reached the sapwood. It was found that S. multistriatus made an average of 56.75 injuries per tree, whereas

H. rufipes made an average of 29.49. In the case of S. multistriatus 20.31 percent of the injuries were made in the tree trunks, but H. rufipes made 46.69 percent of its injuries in the trunks.

Dutch elm disease vectors.--The Morristown, N. J., laboratory has a room in which species of insects known or suspected of acting as vectors of the Dutch elm disease fungus (Ceratostomella ulmi) are reared from elm wood. The wood is placed in metal containers and as the adult insects emerge they are attracted into glass receptacles attached to the metal containers. These adults are used in various experiments and at times it is necessary to use individuals not contaminated with the fungus. Cooperative experiments conducted by C. H. Hoffmann, of the laboratory, and C. S. Moses, of the Bureau of Plant Industry, indicate the possibilities of an adult that carries the fungus contaminating others, where such rearing methods are used. Extreme care must therefore be used when a supply of noncontaminated insects is desired. The experiments further indicate that percentages of adults carrying the fungus, based on individuals collected under such conditions, might be quite different if the adults emerged in the open under natural conditions. Messrs. Hoffman and Moses conducted their experiments with adults of the smaller European elm bark beetle (S. multistriatus). Beetles were contaminated by allowing them to walk over chips of elm wood bearing abundant core-mia of the fungus. Twenty-five noncontaminated beetles were placed in each of four 250-cc glass flasks. One contaminated beetle was added to one flask, 2 to the second, 5 to the third, and 10 to the fourth. After the flasks had been held for 18 hours in a temperature of approximately 73° F. the beetles were removed and cultured. The fungus was obtained from all but two of the beetles. These two came from the flask in which one contaminated beetle had been placed with 25 noncontaminated ones.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Progress of the gypsy moth project.--The number of W. P. A. workers engaged in gypsy moth work in Maine, Vermont, Massachusetts, Connecticut, New York, New Jersey, and Pennsylvania had increased to 3,206 at the end of December. Since July 1 these men have scouted more than 1,500,000 acres, approximately one-half of the acreage being in Vermont. They also scouted over 6,500 miles of roadsides, Maine and Vermont containing more than one-half of the total mileage. They have destroyed in excess of 975,000 egg clusters, nearly two-thirds of them in Massachusetts. More than 4-1/4 million trees in open country were examined and approximately 6,000 acres of woodland were thinned. In addition, nearly 140,000 feet of wire fence that was used to enclose sprayed areas adjacent to pastures has been removed and placed in the storehouse in Greenfield, Mass., as any danger of poisoning cattle that might stray from their pastures is now past.

Clean-up work progressing at large colony in Shawangunk, N. Y.--Federal W. P. A. workers under the supervision of the Conservation Department of the State of New York, in cooperation with the Federal Gypsy Moth Office, located and destroyed more than 18,500 egg clusters by the end of December.

Infestation in barrier zone in process of elimination.--Intensive scouting and clean-up work is continuing. More than 4,000 egg clusters had been croosoted up to the end of December at an infestation in the township of Putnam Valley, Putnam County, N. Y. The outside limits of this infestation, which is in the south-central part of Putnam County in the barrier zone, have not yet been determined, but most of the infestation so far discovered is confined to wooded areas composed chiefly of oak.

No gypsy moth infestations found in New Jersey.--Intensive scouting was continued in the vicinity of the assembling cage that recovered a male gypsy moth during the summer in Mendham Township, Morris County, N. J., by experienced W. P. A. workers under the direction of a State employee. The same type of work was also being carried on in Randolph Township in Morris County, Caldwell Township in Essex County, Bernards Township in Somerset County, and Fanwood and New Providence Townships in Union County. No infestations have been found in any of the localities as a result of this work.

New infestation found outside of quarantine line in Pennsylvania.--On December 18 a gypsy moth infestation was located in Dyberry Township, Wayne County, Pa., a short distance outside the present quarantine line and in the northeastern part of the infested territory. The infestation is located on the southwestern slope of a ridge, in a woodland area approximately 500 feet from the nearest woodedge and 1,200 feet from the nearest highway. The woodland is chiefly second growth, the largest trees being about 18 inches in diameter measured breast-high, and consists of beech, maple, ash, black birch, wild black cherry, basswood, and elm, with a scattering of poplar. The predominating species is beech. While the limits of infestation have not yet been definitely determined, it apparently does not cover a large area and its complete eradication does not appear to present any serious difficulties. Assembling cages were placed approximately 1/2 mile apart throughout the entire township during the summer of 1934. Seven of these cages were located within 1 mile of this colony, one of them being less than 1/2 mile distant, but no gypsy moths were captured. For this reason no scouting work was carried on in the township during the fiscal years 1935 and 1936. It was decided to scout the township this year as a precautionary measure, after the discovery of an infestation in the northeastern corner of Carbondale Township, located within the quarantined area in Lackawanna County, and only a few miles distant from Dyberry. This resulted in the discovery of the Dyberry infestation.

Alert inspectors prevent reinfestation of area where eradication campaign is in progress.--In one case an infestation of approximately 300 egg clusters was found in the borough of Breslau, situated in the northwestern portion of Hanover Township, Luzerne County, Pa., on property that had recently been vacated. Arrangements were made to inspect the foundation and cellar of the vacated building, and several egg clusters were located and destroyed. The people who had moved were traced to the Firwood Section of Wilkes-Barre, where an intensive extermination campaign had been waged. Inspectors were sent to the Wilkes-Barre address to inspect all material from the Breslau residence that might be infested by this insect and they found and destroyed 14 new egg clusters on lumber that had been transported. In a

second case inspectors found and destroyed a total of 34 egg clusters on a lot of second-hand lumber in Plains Township, Luzerne County, while examining it prior to shipment to other localities. Unconscious reinfestation of areas where the insect has been eliminated by people who are unaware of the quarantine regulations, as well as deliberate violations of those provisions, can only be prevented by constant alertness on the part of the inspectors responsible for the enforcement of the quarantine.

Progress of C. C. C. gypsy moth work.--From July 1, 1936, to January 2, 1937, the C. C. C. camp enrollees engaged in gypsy moth work in towns east of the barrier zone in Massachusetts, Connecticut, Vermont, and New Hampshire have scouted more than 500,000 acres and over 1,300 miles of roadside; have examined nearly 557,000 isolated trees and slightly more than 37,500 yards of stone walls; have thinned and cleaned almost 3,000 acres of woodland; have destroyed approximately 1,800 isolated trees; and have treated over 2,850,000 egg clusters.

Connecticut C. C. C. camps receive gypsy moth literature.--A considerable amount of gypsy moth literature, colored cards, and posters was distributed to all of the C. C. C. camps in Connecticut, in order to increase the men's knowledge of their work and to stimulate their interest.

Arrangements made for important work in Vermont.--It had been intended to work in this locality last year, but the plan was necessarily abandoned because of a decrease in enrollment. Work in this section is especially important, as Plymouth is located in the general direction of spread of the insect from the Connecticut River towns through a break in the mountains in a northwesterly direction, up a valley, toward the barrier zone.

Type mapping completed on one block in Massachusetts.--The type mapping of a large tract of land in the northeastern section of Greenfield and extending into the southern part of Bernardston, Mass., by the E. C. W. forester cooperating with this office, with the assistance of a small crew of men from the Greenfield C. C. C. camp, is progressing satisfactorily. Base (or control) lines have been established, cruise lines have been run, and the type mapping has been completed in one block of approximately 273 acres. It is planned to type map other adjacent blocks, bringing the total acreage mapped up to slightly more than 1,300 acres. This area will be cleaned and thinned, and will serve as a demonstration of accepted silvicultural procedure as applied specifically to gypsy moth control.

Progress of brown-tail moth work.--The number of W. P. A. workers employed on the brown-tail moth project had increased to 1,330 at the end of December. The crews were widely distributed over practically all of the area of known infestation in Maine, New Hampshire, Vermont, and Massachusetts, and were engaged mainly in scouting for infestations and in cutting and destroying all winter webs found, although some of the crews in New Hampshire continued the elimination of favored food plants during the first part of the month. Since July 1 the crews have examined more than 5,860,000 trees, have cut over 109,000 trees, have scouted approximately 12,000 miles of road, and have cut and destroyed nearly 800,000 winter webs. No sign of an infestation has been discovered in Vermont.

Infestation generally lighter than last year.--Although a few localities have been found to be quite heavily infested, reports from the field indicate that over much of the infested territory the infestation is far lighter than it was at this time last year. This can probably be largely attributed to the intensive clean-up campaign waged over the infested region during the previous season.

PLANT DISEASE CONTROL

Winter rust studies in connection with barberry eradication.--A close watch has been kept on the development of stem rust in certain areas of Texas during the fall and early winter. Wallace Butler reports exposing vaselined slides during November and December as a means of accumulating further data relative to the source of inoculum for the rust that ordinarily develops in Texas during the late fall months. It is expected that the information obtained from these slides will be of some value in determining whether viable rust spores are being blown from Mexico at this time of the year. Certain species of barberries that have proved highly resistant or immune to stem rust in the outdoor test garden at Bell, Md., are being tested this winter under controlled conditions in the greenhouse at Saint Paul. This work, which is conducted by R. U. Cotter, serves as a further check on doubtful species and the progeny from those that have proved highly resistant or immune when tested under the more natural outdoor conditions.

Weather conditions favored field activities in barberry eradication in November and December.--An average of more than 3,800 security wage earners were employed on barberry eradication during November and about 2,600 to 2,800 during December. With few exceptions, field supervisors reported very favorable working conditions. In many States timbered areas, made practically impassable by heavy underbrush during the summer months, have been worked with much greater efficiency during the early part of the winter. The same is true of some swamp areas in certain parts of Michigan and Indiana.

Chicago survey.--A survey of Cook County, Ill., for barberry bushes has been completed. Robert W. Bills, in charge of barberry eradication in Illinois, reports that during 1936 approximately 6,000 barberry bushes were destroyed on 458 properties in Cook County. A complete survey of the city of Chicago has now been made for the first time since the barberry-eradication program was undertaken. During the year nearly 7,000 square miles of area in Illinois has been intensively surveyed. This includes much heavily wooded and cutover land along rivers in the north-central part of the State.

Talk on barberry eradication at Morris Arboretum.--On January 9, L. M. Ames gave a talk entitled, "Barberries, Friends and Enemies", before a group at the Morris Arboretum, Philadelphia, Pa. Dr. Ames, in addition to summarizing recent progress in barberry eradication in Pennsylvania, briefly reviewed the barberry problem in the United States from the taxonomic point of view.

Spread of white pine blister rust in the sugar pine region in 1936.--During 1936 new blister rust infections were found in six counties in Oregon--Coos, Jefferson, Lane, Clackamas, Hood River, Curry, and Josephine. All of

these counties had been reported as having blister rust infections prior to this year, with the exception of Josephine County, where infection was found for the first time on October 15, 1936. The hosts infected were Pinus lambertiana, P. monticola, P. albicaulis, Ribes cruentum, R. bracteosum, and R. glutinosum. In California, where blister rust was reported for the first time in 1936, infections were found in two counties--Del Norte, where the rust was found at two locations, P. lambertiana and R. bracteosum being the infected hosts, and Siskiyou County, where the rust was found at three locations on P. lambertiana, R. bracteosum, R. sanguineum, R. lobbii, and R. cruentum. In view of the present known distribution of the rust in this region, and its propensity for long-distance spread, it is essential that the blister rust control program be carried on as rapidly and energetically as possible to prevent damage in commercial sugar pine stands.

Results of pine- and control-area mapping under W. P. A. program in Northeastern States.--Since the first of October 1936, approximately 330 W. P. A. relief laborers have been employed on blister rust control activities in all of the Northeastern States except New Jersey. Most of these employees have been assigned to preeradication survey work, which consists of the preparation of maps showing the location of white pine areas and the boundaries of blister rust control protective zones. In addition to this survey work, a few W. P. A. laborers have been used in New York on blister rust canker elimination work in publicly owned white pine plantations. During the period October 1 to November 30, 1936, a total of 503,129 acres have been mapped under this W. P. A. project. In addition, 649,378 acres were examined and eliminated from control work, owing to lack of sufficient pine to justify the cost of Ribes eradication. A total of 234 miles of control area boundary lines were also painted in the field. This mapping work required 7,939 man-days of labor and gave much needed employment to men obtained from relief rolls.

Another county from Wisconsin infected with blister rust.--T. F. Kouba, in charge of blister rust control work in Wisconsin, reports another newly infected county from his State, namely, Fond du Lac County, where blister rust was discovered on 17 Ribes nigrum bushes on November 17, 1936. This makes 3 counties in Wisconsin in which blister rust was reported for the first time in 1936 on Ribes, and 10 counties in which the rust was reported for the first time on white pine.

COTTON INSECT INVESTIGATIONS

Sulphur and arsenical mixtures for the cotton flea hopper and other insects.--During the last few years considerable interest has been manifested in the use of mixtures of sulphur and arsenicals for the control of the cotton flea hopper and other cotton insects. Last season several insecticide dealers sold considerable quantities of mixtures of sulphur and paris green. The tests with the mixtures of sulphur and arsenicals indicate that they kill a much higher percentage of adults, give quicker control, require fewer applications for the cotton flea hopper, and control the boll weevil and leafworm at the same time. K. P. Ewing and R. L. McGarr conducted a series of cage tests and four plot and four large-scale field tests at Port Lavaca, Tex.,

against the flea hopper, and a series of plot tests at Edna, Tex., against the boll weevil last season with these mixtures. In the cage tests 20 percent calcium arsenate-80 percent sulphur caused 26 percent mortality of the adult flea hoppers; the 33-1/3 percent calcium arsenate-66-2/3 percent sulphur, 24 percent; 50 percent calcium arsenate-50 percent sulphur, 23 percent; 10 percent paris green-90 percent sulphur, 56 percent; sulphur, 15 percent. The flea hopper infestation was much lower than it had been during the preceding 3 years and the unusually heavy rains (26 inches during May, June, and July) were unfavorable for experimental work and seriously affected the yields and gains secured from the control measures. The average increase in yield from the four 1-acre plots was 127 pounds of seed cotton per acre from the 10 percent paris green-90 percent sulphur mixture, 94 pounds from the 20 percent calcium arsenate-80 percent sulphur, and 88 pounds from the sulphur. The average yield of the checks was 455 pounds per acre. An average of four dust applications of about 12 1/2 pounds each per acre were applied. In the four large-scale experiments dust was applied with traction or tractor machines to 7-acre fields of cotton. The average gain from the 10 percent paris green-90 percent sulphur mixture was 130 pounds per acre; from the 20 percent calcium arsenate-80 percent sulphur, 130 pounds; and from the sulphur, 134 pounds per acre. Field-infestation and bloom-count records showed there was very little difference in the control from the paris green-sulphur and calcium arsenate-sulphur mixtures and that both gave better control than did the sulphur. In the boll weevil tests at Edna, Tex., where the infestation was rather heavy, the heavy rains and spotted bollworm infestation late in the season also interfered with the experiments. In this series different percentages of calcium arsenate and sulphur were compared with the 10 percent paris green-90 percent sulphur and calcium arsenate. The results were as follows:

Insecticide	Plot : Average gain of	
	no.	seed cotton per acre
		Pounds
20% calcium arsenate-80% sulphur-----	6	167
33-1/3% calcium arsenate-66-2/3% sulphur---	3	281
50% calcium arsenate-50% sulphur-----	5	200
Calcium arsenate-----	8	174
10% paris green-90% sulphur-----	11	82

The mixtures were used at the rate of 10 to 12 pounds per acre and calcium arsenate at 5 to 6 pounds per acre. It is believed that a late bollworm infestation in the 50 percent calcium arsenate-50 percent sulphur plots caused them to produce less than the 33-1/3% calcium arsenate-66-2/3 percent sulphur plots. In cage tests at Tallulah, La., G. L. Smith and A. L. Scales obtained the following percentages of control.

Insecticide	Control of	
	Boll weevil	Leafworm
	Percent	Percent
20% calcium arsenate-80% sulphur-----	44	71
33-1/3% calcium arsenate-66-2/3% sulphur--	56	83
50% calcium arsenate-50% sulphur-----	53	84
10% paris green-90% sulphur-----	46	78
Calcium arsenate-----	79	90

In Latin-square tests against a light infestation of boll weevils at Tallulah, La., R. C. Gaines found the increased yield for calcium arsenate over 50 percent calcium arsenate-50 percent sulphur insignificant, but the gains from both over the checks were significant. Plot tests were conducted by M. T. Young and G. L. Garrison at Tallulah with the mixtures in comparison to calcium arsenate against the boll weevil. The weevil infestation was extremely light all season and the gains from calcium arsenate were only about one-third of what they usually are. In five tests the 20 percent calcium arsenate-80 percent sulphur mixture gave an average increase in yield of 170 pounds of seed cotton per acre and the comparable calcium arsenate plots 160 pounds. The checks produced 1,882 pounds per acre. The infestation records, however, showed the calcium arsenate gave much better control. In seven tests the mixture of 33-1/3 percent calcium arsenate-66-2/3 percent sulphur gave an increase of 173 pounds and the calcium arsenate 105 pounds of seed cotton per acre. The checks averaged 2,293 pounds per acre. The two calcium arsenate-sulphur mixtures were applied at the rate of 15 to 18 pounds per acre and the calcium arsenate at 4 to 6 pounds per acre. In three tests the 10 percent paris green-90 percent calcium arsenate gave an increase of 10 pounds, the comparable 33-1/3 percent calcium arsenate-66-2/3 percent sulphur 252 pounds, and the calcium arsenate 204 pounds of seed cotton per acre. The checks produced 2,441 pounds. The square-infestation counts showed slightly better weevil control from the 10 percent paris green-90 percent calcium arsenate mixture than with calcium arsenate or the calcium arsenate-sulphur mixture. The yield records are not in line with the infestation records and the larger yields obtained were probably due to the control of mirids by the calcium arsenate-sulphur mixtures. In a few tests against the bollworm at College Station, Tex., the 10 percent paris green-90 percent sulphur mixture gave about the same increase as calcium arsenate and was more effective than the calcium arsenate-sulphur mixtures. All of the mixtures for flea hopper and boll weevil control held the leaf worm in check, although those with more arsenic gave quicker control. Although the results are not conclusive, they indicate that mixtures of calcium arsenate and sulphur are more effective against the boll weevil than paris green-sulphur mixtures and will give satisfactory control of the flea hopper, the boll weevil, and the leaf worm.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Gin-trash inspection.--Gin-trash inspections in the 1936 cotton crop were completed at the end of the second week in December. In the Salt River Valley of Arizona two machines were operated during this period with negative

results. Trash from all gins in the valley was inspected and, in view of the lateness of the season, it is believed that a very good job was done.

Field clean-up in the Big Bend of Texas.--The clean-up of cotton fields in the Big Bend area of Texas was discontinued on December 19. In the beginning it was known that funds were not sufficient to clean the entire area, and consequently an effort was made to clean the most heavily infested fields. In practically every case this was accomplished. A total of 1,228 acres was cleaned. In the Castolon district, in Brewster County, one farm, consisting of about 100 acres, was pastured with some 600 head of cattle. After the cattle had been in the fields for several weeks an investigation was made and it was found that the fields were surprisingly clean. Practically no material was left and very little had been tramped into the ground. Last fall work was begun to develop a machine to burn the material in cotton fields, instead of regular clean-up with laborers. The experiments have now reached a point where we can say positively that the principle is a success. It has been definitely established that there is enough fuel in the cotton field to burn all of the debris. The experiments are still going forward, and there is every indication that these machines can be used in future clean-ups to better advantage than the old method.

Wild cotton eradication.--The eradication of wild cotton in southern Florida made very good progress and by the end of December all of the cotton areas in Pinellas, Hillsborough, Manatee, and Sarasota Counties had been recleaned. A few keys remained to be cleaned to complete Lee County. In Charlotte County and in a considerable portion of Collier County all of the areas accessible by car had been recleaned. All of the above counties are on the west coast. At each recleaning the number of plants is found to be greatly reduced and in a number of locations none was found. Indications are that eradication will be completed in these west coast counties several years in advance of other areas, because there was considerably less cotton to begin with and because more man-days have been devoted to this section. This was considered advisable because the section is much closer to domestic cotton, and infestation was originally found in the vicinity of Bradenton. Several of the mainland keys have been recleaned and satisfactory progress made on the others. The situation on Boca Grande Key is of particular interest. Last season around 1,000,000 plants were removed during the recleaning, whereas at this time slightly over 3,000 plants were removed. At this time some bolls were present on a few of the sprout plants and seedlings which had made unusual growth, but none of these had shattered, and during the recleaning none of the cotton was allowed to drop to the ground. Some 400 bolls were examined and 4 pink bollworm larvae were found. The original infestation on this key was about 35 percent. A camp was reestablished at Cape Sable and recleaning begun on December 7. At the close of the month a considerable area had been recleaned. During the recleaning when a number of bolls are encountered they are placed in preservative for later inspection. When only a few bolls are present they are immediately inspected. Other than the findings on Boca Grande Key the results have been negative.

Thurberia-plant eradication.--The eradication of *Thurberia* plants in the Santa Catalina Mountains of southern Arizona has progressed satisfactorily considering weather conditions. Early in the month it was realized that work could not be continued much longer using Camp Lawton as a base, because of the high elevation. A new site was therefore found in Sabino Canyon at a much lower elevation. By the middle of the month all of the equipment had been transferred to this new site, named Camp Sidney Smith. During the month 3,030 acres were gone over and 40,030 *Thurberia* plants destroyed. These plants occurred at elevations up to 5,400 feet. The highest elevation at which plants have been found thus far is 5,600 feet.

Road-station inspection.--During December 10 interceptions made at the Marfa, Tex., road station were found to be infested with the pink bollworm. The infested material consisted of small lots of seed cotton, from which 53 living and 8 dead larvae of the pink bollworm were taken. One of the interceptions was of particular interest. The owner of the car stated that he had moved to the Big Bend area to farm, but after remaining there a few weeks decided he did not like it and was returning to Coahoma, Tex. He had 3 pick sacks in his car in which were found 36 locks of seed cotton. The seed cotton contained 7 living and 2 dead pink bollworm larvae. He first claimed the material was from his first location, which is outside the regulated area, but later admitted that he had been picking cotton in the Big Bend. Heretofore the road station has been discontinued around the first of January, as field clean-up in the Big Bend was usually completed by that date. Due to the fact that all of the fields had not been cleaned this season, and a considerable number of infested interceptions are being made, it is considered advisable to keep the road station in operation for the time being.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Solutions containing free nicotine promising against mushroom flies.--Tests made by A. C. Davis against various species of mushroom flies and other pests in the mushroom houses at the Beltsville, Md., laboratory demonstrated that free nicotine (40 percent) in water at dilutions of 1-100 and 1-200 (containing 0.4 and 0.2 percent free nicotine, respectively), applied as a drench to the mushroom beds at the rate of 100 cc per square foot promised control of the flies and other pests and caused a marked increase in the production of mushrooms on the beds receiving this treatment. Beds treated at 4-day intervals, with a total of five or six treatments, yielded approximately one-third more mushrooms than those treated at 8-day intervals, and gave about twice the yield of the untreated beds. Nicotine preparations containing from 95 to 98 percent nicotine, when diluted at the rate of 10 to 12 ounces per 100 gallons of water (0.5 to 0.6 percent nicotine) have long been used as a drench for the control of mushroom flies in England. In this series of experiments, however, dilutions of 40 percent nicotine 1-400 (containing 0.1 percent nicotine) or greater, gave little or no increase in yield. Samples of mushrooms treated with the free nicotine solutions were analyzed by the Insecticide Division of this Bureau. The results of such analyses show that the highest nicotine content of any sample was 29 parts per million by weight, a quantity not believed to be harmful to the consumer.

Relative effectiveness of cube dusts containing various dilutions of rotenone against tobacco flea beetle.--In experiments designed to show the relative toxicity of cube dust mixtures containing 1.5, 1.0, and 0.5 percent rotenone, respectively, against the tobacco flea beetle (Epitrix parvula Fab.) on shade-grown tobacco in Florida, F. S. Chamberlin, of the Quincy, Fla., laboratory, reports that the dust mixtures containing 1.0 and 1.5 percent rotenone, respectively, were much more toxic and gave a better control of the flea beetles than the cube dust mixture containing 0.5 percent rotenone. These conclusions were reached as a result of a detailed study of the harvested product, in which it was shown that the percentages of injured leaves, together with the percentages of the commercial gradings, served as a satisfactory method for obtaining a relative comparison of the effect of the different dilutions used. Incidentally, these studies demonstrated that a flea beetle infestation of only moderate intensity may cause a loss in cigar-wrapper tobacco which reaches \$475 per acre, if insecticidal control measures are not adopted.

Comparative efficiency of different spreading, wetting, and sticking agents used with rotenone compounds against pea aphid.--In the course of recent tests performed in the greenhouse by T. E. Bronson, of the Madison, Wis., laboratory, which involved the use of different spreading, wetting, and sticking agents with the derris sprays ordinarily employed for combating the pea aphid (Illinoia pisi Kalt.), it was indicated that a commercially prepared product containing a sodium oleyl alcohol sulphate was the most effective agent used with derris, and that resins or other adhesive agents were not effective in protecting the active ingredients of derris from loss either through decomposition or by the effect of washing with a water spray. In the course of these experiments the pea plants were first sprayed with a derris solution containing one of the spreading, wetting, or sticking agents. Some of these treated plants were infested by hand methods 24 hours after they had been sprayed and others were washed twice with water and infested 5 days after spraying. The results of these tests show that there was some residual effect of derris in all of the tests in which plants were infested with the pea aphid 24 hours after spraying, but it was indicated that probably no residual effect of derris was apparent in the tests where plants were washed twice after spraying and then infested with the pea aphid.

Late planting aids wireworm control in potatoes.--K. E. Gibson, of the Walla Walla, Wash., laboratory, reports that as a result of experiments performed during 1936, it was shown that considerable benefit could be derived by the late planting of potatoes in fields infested with the sugar beet wireworm (Limonius californicus Mann.) and the Pacific coast wireworm (Limonius canus Lec.). In experimental plots planted on April 7 and harvested during the period from August 10 to 17, an average of 57 percent of the potatoes was injured by wireworms, whereas in the experimental plots planted on June 23 and harvested early in November, an average of approximately 44 percent of the tubers showed wireworm injury. Actually the difference in the relative wireworm injury suffered by early and late plantings of potatoes was less in 1936 than during previous years, because seasonal conditions in 1936 were such that the wireworms did not begin their seasonal migration downward until a later date than normal. The results of time-of-planting tests to escape maximum wireworm damage have demonstrated that the

late-planted potatoes suffer significantly less wireworm injury than do early planted potatoes, even though late planting usually gives reduced yield.

Tomato pinworm larvae pupate at or near soil surface.--J. C. Elmore, of the Alhambra, Calif., laboratory, has determined that a very high percentage of the larvae of the tomato pinworm (Gnorimoschema lycopersicella Busck) pupate at or just below the soil surface. Field examinations indicated that approximately 80 percent of the larvae pupated in the top half-inch layer of soil and that approximately 98 percent of them pupated in the first inch. These field observations were supplemented by laboratory experiments simulating field conditions in which it was shown that 99.5 percent of the G. lycopersicella larvae formed pupal cells in the top quarter-inch layer of soil and that the remainder were present in the quarter-inch layer of soil below that depth. It is apparent that the tendency of the tomato pinworm larvae to pupate very close to the soil surface may make it possible to ascertain some measure of control of these pests through the medium of cultural practices directed toward the disturbance or destruction of the pupal cells during critical periods.

Beet leafhopper populations increase in San Joaquin Valley.--G. T. York, of the Modesto, Calif., laboratory, reports that population surveys of the beet leafhopper (Eutettix tenellus Bak.) made in the San Joaquin Valley of California during the fall of 1936 have indicated that in nine districts, totaling about 65,000 acres, there were approximately 25,000,000 E. tenellus. This is about three times the population found in the same districts in 1935 and approximately one-fifth of that found in the same districts in 1934.

INSECTS AFFECTING MAN AND ANIMALS

Ants appear to be efficient destroyers of screwworm larvae.--Observations made by A. W. Lindquist, of the Uvalde, Tex., laboratory, indicate that various species of ants are of great importance as destroyers of large larvae of Cochliomyia americana Cushing and Patton in animals that die of screwworm infestations. Emergence records kept on seven carcasses harboring approximately 9,400 third-instar larvae show that the ants had killed about 92 percent of them.

New locality records for Phlebotomus diabolicus Hall.--Mr. Lindquist reports that P. diabolicus, the biting psychodid, has been more abundant and more troublesome than at any time since 1931. The earliest record in 1936 was April 29 and the latest November 20. The height of incidence occurred from September 15 to November 2. These pests were very annoying during this period and many people reported them. About 120 specimens were collected (mostly females) in October in one residence at Uvalde, Tex. A very interesting note was made on June 13, when one Phlebotomus was caught and others observed by a campfire on the banks of the Nueces River, 2 miles from any human habitation, in the vicinity of Camp Wood, Tex. This note points toward a wild animal host for this pest as well as giving a new locality record. Another important record was made by Claudelle Lewis, of the Screwworm Control

Division, San Antonio, Tex., when she determined the presence of Phlebotomus during the summer and fall. This constitutes a new locality record and extends the distribution of the pest.

Winter activity of primary screwworm fly.--D. C. Parman, of the Uvalde, Tex., laboratory, reporting on the number of screwworm infestations in the vicinity of Uvalde for the period January 4-9 inclusive, states: "During this period practically all ranches have had screwworm cases, there being a considerable increase during this week. Ranchmen reported from 3 to 40 cases. There have been estimated from 300 to 400 cases during the past 10 days in this vicinity. All of the larvae collected from these cases were C. americana." For Valdosta, Ga., E. W. Laake reports as follows: "Heavy oviposition on December 26 and 27 of C. americana in hibernation cages indicates that this species will overwinter at Valdosta this winter. This generation, which should emerge as adults the latter part of February or early in March, will have a very good chance at that time, under normal local climatic conditions, to continue reproduction into the next summer." At Tempe, Ariz., C. C. Deonier reports that the status-trapping work in Arizona has indicated that C. americana was as abundant along the escarpment between Phoenix and Prescott during the fall as at Uvalde, Tex. The work shows a considerable decrease in C. americana at Tempe during the fall and early winter and no increase during the latter half of December, as there was at Uvalde. The decrease continued into the latter half of December, only two C. americana being taken in the total fly catch, and three in the lower part of Black Canyon. Besides these no C. americana, and very few C. macellaria Fab., were taken during the latter half of the month. The total catch in all of the traps continued to decrease during the latter half of the month.

Salt water appears necessary to induce oviposition of sand flies.--J. B. Hull, of the Savannah, Ga., laboratory, reports the following observations on experiments to secure oviposition of sand flies in the laboratory: "Numerous sand flies were collected on 2 days in October by sweeping. These were placed in fruit jars, brought to the laboratory, and transferred to glass lamp chimneys. One end of each chimney was covered with cheesecloth and the other placed over blotting paper moistened with distilled water. These sand flies were given three meals of human blood, but failed to deposit any eggs. Sand flies were collected on December 6 and 7 and the same procedure was followed except that the blotting paper was moistened with salt water collected from the marsh. From this collection 391 eggs were deposited. Apparently the salt water stimulates oviposition."

Sand fly research resumed at Fort Pierce, Fla.--The Division of Insects Affecting Man and Animals has recently resumed research work on the sand fly problem along the east coast of Florida. The laboratory is located in the city hall at Fort Pierce, with S. E. Shields in charge.

Moderately low temperatures increase longevity of tick parasite.--C. N. Smith and Helen Louise Trembley, working on the biology of Hunterellus hookeri How., a hymenopterous parasite of the American dog tick and the brown dog tick, have found that the longevity of the adults at temperatures of 40° F. is 5 days and at 55° to 65° it is 2 weeks. The normal longevity at approximately 80° averages from 2 to 3 days.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Fourteen living larvae of the Mexican fruit fly (Anastrepha ludens Loew.) were intercepted at El Paso, Tex., on September 21, 1936, in a cherimoya (Annona cherimola) fruit in baggage from Mexico. A living larva of the West Indian fruit fly (Anastrepha acidusa Walk.) arrived at Mobile, Ala., on August 7, 1936, in a mango fruit in ship's stores from Puerto Rico. A living adult of the bruchid Acanthoscelides xanthopus (Suffr.) was taken at Washington, D. C., on October 16, 1936, in seed of Cassia didymobotrya in the mail from Cuba. Living specimens of the coccid Asterolecanium stentae Brain were intercepted at San Francisco on September 16, 1936, on Caralluma schweinfurthii and Huernia campanulata in the mail from the Union of South Africa. Two living specimens of the chermid Rhinocola ericae Curt. were found at Philadelphia on September 10, 1936, on heather in the mail from Scotland. Living adults of the hairy-vetch bruchid (Bruchus brachialis Fahr.) arrived at Baltimore, Md., on September 18, 1936, with vetch seed in cargo from Germany. A living adult of the elaterid Pheletes quercus Oliv. was taken at Norfolk, Va., on August 24, 1936, with a hyacinth bulb in cargo from the Netherlands. The coccids Phenacaspis samoana Doane and Ferris and Pseudococcus cocotis (Mask.) were intercepted at Honolulu, Hawaii, on August 4, 1936, on coconut-leaf baskets in cargo from American Samoa. A living adult of the weevil Sitophilus mexicanus Champ. was taken at Laredo, Tex., on July 13, 1936, in a green bamboo pole in baggage from Mexico. Aleurolobus marlatti (Q.) arrived in baggage as follows: At New York on November 14, 1935, on citrus leaves from Italy; at Seattle, Wash., on November 30, 1935, on a tangerine leaf from Japan; at Seattle on December 16, 1935, on an orange leaf from Japan; and at El Paso, Tex., on March 25, 1936, on orange leaves from Mexico. These represent the first records in our files of this whitefly being intercepted. Two living larvae of the large cabbage butterfly (Pieris brassicae L.) were taken at New York on August 6, 1936, on green leaves of broccoli (Brassica oleracea botrytis) in ship's stores from Italy.

An individual convinced.--On December 17, 1936, the British SS Clan Graham entered the port of Norfolk, Va., from London, England. In making the usual inspection of quarters, the inspector was accompanied by the ship's fourth officer. This officer's seeming amusement of each room inspection finally got under the inspector's skin, so the inspection was temporarily halted for explanations. The inspection may have been amusing to the Britisher, but was serious to the inspector and the Britisher was so informed. Apparently the British officer had made few trips to the United States, and had never accompanied an inspector on his rounds. After the purpose of the work had been explained, he vouchsafed that his ignorance of what we were doing permitted him to see only the funny side, but that henceforth, having been enlightened, he would be in a position to see the serious side. The inspection was continued with splendid cooperation on the fourth officer's part.

Pathological interceptions of interest.--Our first interceptions of Ascochyta lycopersici Brun. were made at New York on December 3 and December 17 on eggplant from Italy and on tomato from French Morocco. Ascochyta pisi Lib. was intercepted from Poland for the first time on December 2 at New York,

in hairy vetch seed in cargo. Our first interception of an Ascochyta on parsley was an undetermined species in parsley from Germany at New York on December 4. Botrytis elliptica (Berk.) Cke., first interception, was taken at Sumas, Wash., on December 7, in a shipment of lily bulbs from Japan. Cercospora sp., no species found listed for the host, was found in Cordia boissieri at Laredo in baggage from Mexico. Cladosporium carpophilum Thuem. was intercepted from South Africa for the first time on December 8 on apricots at New York. Helminthosporium allii Campanile was intercepted on garlic from Cuba (new country) December 1 at Mobile. A pod rot of peppers from Cuba, intercepted at New York on December 13, seems to be the same as one described by Weber (Fla. Bul. 244:42), the organism being named as Helminthosporium curvulum Sacc. Phyllosticta grandimaculans Bub. and Krieg. was intercepted (first interception) at New York on December 5 on strawberry plants from Norway, in baggage. Phyllosticta japonica Miy. was intercepted for the first time on December 14 at Seattle in paddy rice from China in the mails. P. laeliae Keissler (first interception) was found on Laelia anceps from Mexico on November 20 at San Francisco. A severe rot of pears and apples was found in fruits from Germany taken at New York on October 23 and November 20, and of apples from Poland on December 17, all in baggage. The pathogen in each case appears to be Sclerotinia laxa (Ehrenb.) Aderh. and Ruhl., which is known as a serious rot of stone fruits in Europe. Sclerotium oryzae Catt. was found on rice straw from Greece on December 3, and from Jamaica on December 16 (additional countries), at New York. Septoria lactucae Pass. leaf spot of lettuce, was intercepted from Trinidad for the first time on December 3 at New York.

DOMESTIC PLANT QUARANTINES

Transit inspectors to certify materials under quarantine.--The practice of turning back shipments of restricted materials found on inspection at railway terminals to be moving in violation of domestic Federal plant quarantines is being modified. Transit inspectors are now authorized to examine certain types of such materials as may be readily and adequately inspected at a railway terminal and, if found to be free from the pest involved, to certify the shipment and allow it to proceed to the consignee. Interception records show that many persons making shipments are unaware of the existence of Federal quarantines, and it is felt that inspection in transit is a service which can be given without weakening in any way the effectiveness of the restrictions intended to prevent the spread of the pests. Consignors will be notified as heretofore of violations committed and any repetition of failure to obtain the required inspection at origin will be met by having the shipment returned.

Transit inspection at Atlanta.--In order to inspect shipments moving at this period of the year from nursery centers to points in the southern States, transit inspection is being conducted at Atlanta, the inspector formerly at Kansas City having been transferred to the southern post.

Citrus canker emergency project yields results.--A summing up of the progress of citrus canker inspection and eradication during the past 2 years, as compared with the work of the previous 13 years, indicates that the results accomplished with emergency relief funds have marked the

difference between early eradication of the canker and a prolonged program under limited regular appropriations which were not only inadequate to complete eradication but not sufficient to hold the disease in abeyance. In Texas 35 infected properties were located during the period 1921-34. In 1935-36, 47 infected properties were located in Texas, and 9 in Louisiana. Thorough and complete inspection has been made of the entire citrus-producing areas of Texas and Louisiana, and a large part of the Gulf coast areas of Mississippi and Alabama, covering a total of 69 counties and parishes. A house-to-house inspection of every property in the four infected counties in Texas resulted in finding citrus plants on 2,283 properties. These trees have been destroyed on all but 43 of the properties. Eradication crews employed under emergency relief funds have removed all citrus plants (nearly 11 million) from over 98 percent of the citrus-growing properties in the known infected areas of Louisiana and Texas, thus removing the source of infection from which the disease might eventually reach the commercial areas. In order to complete the eradication of this disease it is necessary to recheck the sites from which such trees have been removed and to reinspect the remaining citrus plantings in the vicinity of old infections.

Peach mosaic inspection and eradication.--In Colorado the eradication work which has been carried on in two counties since August 1935 (suspended only in midwinter) was closed for the season on December 15, and the field leader reports that this marks the completion of the removal of all abandoned and infected peach trees in Mesa County, an important commercial peach-producing area. Some eradication work yet remains to be done in Delta County. In California contacts have now been made with owners of all infected properties, totaling 899, of which 456 have signed releases authorizing removal of their trees. Inspections made in the field season of 1936 cooperatively with the plant-pest control officials of Arizona, California, Colorado, Iowa, Kansas, Nebraska, New Mexico, Texas, and Utah, resulted in finding the peach mosaic disease in all these States except Iowa, Kansas, and Nebraska. Nearly 48,000 mosaic-infected trees were found in 39 counties in these 6 Southwestern States. All known diseased trees have been removed from Colorado and Utah, the eradication work is under way in California and Texas, and will be extended to Arizona and New Mexico early next spring.

Phony peach disease under economic control.--During the past field season over 150 Federal and approximately 50 State inspectors were employed. Surveys for the phony peach disease were carried on in every peach-growing State east and northeast of, and including Texas and Arkansas, with the exception of Michigan, New York, and New England, and over 21,000,000 peach trees were inspected on 196,344 properties in 550 counties of 20 States. Of the 156,977 trees found diseased, 146,072 have been removed. All known diseased trees have been eradicated from eight States, namely, Arkansas, Illinois, Indiana, Louisiana, Mississippi, Missouri, North Carolina, and Pennsylvania. Of the 10,905 diseased trees remaining to be removed from Alabama, Georgia, Kentucky, South Carolina, Tennessee, and Texas, 10,422 are in Georgia, and it is believed that before the winter is over all diseased trees will be removed from all States except Georgia. As a result of these surveys the disease was found for the first time in 1 county each in Indiana and Pennsylvania, and in 52 counties in 12 of the States where the phony peach disease

had previously existed. The environs of every peach-growing nursery in all the known infected States were given a very thorough inspection for the phony peach disease in the season of 1936. Of the 422 nurseries inspected, 104 were found exposed to the disease. A concerted effort by Federal and State inspectors to effect the removal of these diseased trees has been successful to the extent that only one known unprotected peach-growing nursery now remains in the infected States. Over 51,700,000 escaped and abandoned trees have been destroyed by relief workers. The project therefore has a very favorable status.

CONTROL INVESTIGATIONS

High concentration of sulphur found in blood of southern armyworm.--F. H. Babers, of the Beltsville, Md., laboratory, has recently completed an analysis of the blood of the southern armyworm (*Prodenia eridania* Cram.). Some 27 substances were determined by various micro-quantitative procedures. Of these, sulphur was present in very high concentrations, but sugars fermentable by yeast and cholesterol were very low.

Inactivation of toxic principles of pyrethrum by insect tissues.--P. A. Woke, Beltsville, reports on the results of experiments made to determine whether the toxic principles of pyrethrum are inactivated in whole or in part after it has been ingested by the southern armyworm. This work was undertaken as a sequence to the work on the imported cabbage worm reported by Swingle (1934). Mosquito larvae were used in a biological assay method for determination of toxicity. The general conclusion is reached that the tissues of the southern armyworm possess properties capable of bringing about a high degree of inactivation of the toxic principles of pyrethrum.

Methods of rearing the southern armyworm.--Mr. Woke also reports a method of rearing the southern armyworm in large numbers for use in physiological and toxicological studies. The larval rearing cage is essentially a chamber, 36 inches wide, 24 inches long, and 16 inches deep, with glass sides, wood bottom, and frame and screen top, part of which serves as the door. Fresh potted plants are placed on sand in shallow trays in the bottom of the cage. Egg masses which have been deposited on waxed paper are fastened to the leaves of the plants. The larvae develop to maturity in the one cage and those not used in experiments pupate in the sand. The pupae are separated by immersing the sand in water and are placed in an oviposition cage where the moths emerge. Thorough disinfection of cages after each rearing is practiced and recommended. A continuous supply of larvae is provided by the use of four cages, one new cage being started each week.

INSECTICIDE INVESTIGATIONS

More concerning nicotine.--In the October 1, 1936, News Letter, vol. 3, no. 10, p. 30) attention was called to the compilation by the Division of Insect Investigations and the Division of Control Investigations, of a complete bibliography concerning nicotine, and notice was given that Part I, dealing with the chemistry of this compound, had just appeared. Part II of this work entitled, "A Bibliography of Nicotine. The Insecticidal Uses of Nicotine and Tobacco", under the authorship of N. E. McIndoo, R. C. Roark, and R. L. Busbey,

is now available. It has been put out in mimeographed form as E-392 of the Bureau, and is in three separate sections comprising a total of 628 pages, in which are given 2,497 abstracts of articles pertinent to the subject. This completes the work that will be done by this Bureau, the collection of references to the medical aspects of nicotine having been turned over to the Bureau of Chemistry and Soils.

Patent granted on nicotine humate.--In the April 1, 1936, issue of the News Letter (vol. 3, no. 4, p. 18) there was described a new nicotine-containing insecticide developed in this laboratory by L. N. Markwood and called "nicotine peat." As a by-product of the manufacture of this insoluble compound there is obtained a water-soluble product consisting of a combination of nicotine and the humic acid of the peat. It can be obtained as a dry powder containing about 28 percent of nicotine. The Patent Office has now granted a public service patent on this material. It was issued January 5, 1937, as U. S. Patent 2066941.

A source of nornicotine discovered.--Nornicotine, a compound closely related to nicotine, having the formula $C_8H_{12}N_2$, has been known for some time, and recent tests by C. H. Richardson have shown the optically inactive synthetic material to have considerable insecticidal value. C. R. Smith, of the Division of Insecticide Investigations, has now found that nearly 1 percent of this compound exists in the form of the laevo-rotatory isomer in the plant Nicotiana sylvestris.

BEE CULTURE

Biometrical studies of bees.--W. J. Nolan, of the Beltsville, Md., laboratory, reports that of the characters he is measuring of bees, tongue length is the most constant. This is based on a total of many hundreds of bees of various strains. In addition to making some of the conventional measurements, measurement of the cubital index has been undertaken. This index is the ratio of the two parts into which a line through the third cubital cell cutting the cubital vein is divided by dropping a perpendicular from it to the second recurrent vein.

Poor quality of queens an important cause of supersedure.--C. L. Farrar, Laramie, Wyo., has summarized the causes of loss or unfavorable condition of queens in 760 commercial packages shipped from the South and kept under observation in the North during the past season. The causes of loss can roughly be classified under four headings: Failure in shipment or introduction, poor queens, inferior packages, and loss due to management at the receiving end. Of the four, poor quality of queens seems to be of first importance so far as the problem relates to supersedure.

Colonies show indication of resistance to American foulbrood.--A. P. Sturtevant and A. W. Woodrow, Laramie, report that six queens being tested for resistance to American foulbrood are being wintered over. Colonies headed by these queens were each fed ten times the minimum infectious dose of spores of Bacillus larvae. A small amount of disease developed in all colonies and later disappeared. The six colonies had previously shown disease-resisting characteristics.

Nature of coloring matter in beeswax.--In work conducted in cooperation with the chemistry division of the University of California, G. H. Vansell, Davis, Calif., reports that a spectographic examination of color extracts removed from beeswax surprisingly failed to produce bands that coincide with the absorption bands of B carotene. Preliminary tests on the color solutions extracted from beeswaxes showed no absorption bands but rather continuous absorption from about 3700 A° into the ultraviolet. Squash pollen, however, showed five very definite bands lying in the region between 3700 A° and 4700 A°.

Large losses in queen-rearing yard.--E. Oertel, of the Baton Rouge, La., laboratory, has ascertained as a result of studies made in a commercial queen yard consisting of approximately 2,000 nuclei that less than 50 percent of the cells introduced into nuclei resulted in marketable queens. Factors that contribute to such losses are being studied.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

North American moth occurs in Japan.--Among some insect material from Japan recently submitted for determination by R. W. Burrell, through C. P. Clausen, were certain Microlepidoptera obtained in corrugated board strips in which cocoons of Grapholitha molesta Busck had been exposed to parasitization in the field. The moths were identified by August Busck as the common Evippe prunifoliella Chambers, a pest of peaches, plums, and cherries. Apparently this species has not previously been reported from outside the United States.

Additional African fruit fly material for the national collection.--A collection of fruit flies assembled by R. H. Van Zwaluwenburg in the course of a survey conducted by the Bureau in West Africa during the past year was submitted for determination recently. C. T. Greene reports that it contains numerous Trypetidae of economic importance and of unusual interest not previously represented in the national collection. Series of species already in the collection have been also improved by the addition of material showing new distributional data. This fine lot of Trypetidae, combined with the even larger lot from East Africa mentioned in the last News Letter, has enormously enriched the Museum collections, especially in the genera Ceratitis and Dacus.

Box-elder bug in New Jersey.--This injurious pest in its rapid spread over the eastern United States appears to be established in northern New Jersey. Several specimens collected at Haddon Heights, N. J., December 28, 1936, by F. S. Ritchie and sent to the Bureau for identification, were determined by H. G. Barber as Leptocoris trivittatus Say.

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FOR JANUARY 1937

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March 1, 1937

FRUIT INSECT INVESTIGATIONS

New pecan-insect laboratory at Monticello, Fla.--By agreement with the Florida Agricultural Experiment Station, the Bureau has established a new cooperative laboratory at Monticello for the study of pecan insects, with particular reference to the nut case bearer. Samuel O. Hill, for two seasons associated with G. F. Moznette at the Albany, Ga., laboratory, has been placed in charge of the work.

Research laboratory put on wheels.--At the request of the Division of Domestic Plant Quarantines, the Division of Fruit Insect Investigations has undertaken a study of the insects that infest peach orchards where the phony disease is found under conditions of natural spread. The area involved extends across the entire southern region from Georgia to Texas. A trailer shell was fitted up as a mobile laboratory and drawn by a motor truck, which also served as the power unit. Wm. F. Turner is in charge of this work, assisted by Wm. H. Anderson, with Atlanta, Ga., as headquarters. Such a laboratory permits the research worker to carry his equipment to the exact spot where his work should be done, at the exact time when it should be done, with no loss of time incident to dismantling and packing apparatus and reassembling it at a new point. With the power plant in the truck, the worker is independent not only of housing but also of heating and lighting problems. Loss of time because of unfavorable weather at one point can be avoided by moving on to a point where conditions are favorable for work. In 1936 in less than 8 months, the mobile field laboratory traveled more than 10,600 miles, working 28 counties at 60 locations in 11 States, and made 143 collections, representing 3,709 lots of insect material from peach orchards. To cover the same area without the mobile unit would have required several times as much personnel. It would also have required seasonal or temporary laboratory quarters at a number of different points, duplication of equipment, delay in moving equipment and setting up at new points, and restriction of locations where power was not available for certain apparatus, and some locations offering no difficulties to the self-contained laboratory on wheels, would not have been visited.

Repeated applications of tartar emetic cause no injury to citrus.--In connection with a project in cooperation with the Bureau of Plant Industry and the Bureau of Chemistry and Soils, parts of trees at Davenport, Fla., are being sprayed, under the supervision of Herbert Spencer, of the Orlando, Fla., laboratory, at 10- and 20-day intervals over a number of years, to

determine whether tartar emetic bait sprays are injurious in any way, or whether their repeated use affects the population of citrus insects. Tartar emetic has been found an effective poison for use in fruit fly bait sprays. By the end of 1936 the trees that are being sprayed every 10 days had received their 52d application; other trees sprayed at 20-day intervals or at fruit maturity time only, had received their 26th, 24th, 16th, 12th, or 8th sprayings. Careful measurements of trunks, branches, leaves, and fruit, reported by workers of the Bureau of Plant Industry, revealed no injurious effects to date and the analyses made, by the Bureau of Chemistry and Soils, of juice samples from different plots showed no variations that could be attributed to the spray.

Protection of ornamental plants from Japanese beetle attack.--F. E. Baker and W. E. Fleming, of the Japanese beetle laboratory at Moorestown, N. J., report on tests with sprays for protecting ornamental plants. Various sprays which had been proved of value in protecting fruit orchards from beetle attack were tested on Prunus sp., Acer palmatum atropurpureum, and Azalea amoena. A spray composed of 6 pounds of acid lead arsenate with $1\frac{1}{2}$ pints of fish oil, or 6 pounds of acid lead arsenate with 4 pounds of flour, to 100 gallons of water was very effective in protecting these plants. Lime and aluminum sulphate sprays, 20 pounds of lime with 3 pounds of aluminum sulphate, and 20 pounds of lime with 6 pounds of aluminum sulphate, to 100 gallons of water were not effective in controlling the beetle on the nursery stock. This was apparently due to the poor adhesion of these sprays to the foliage. Derris and rosin-residue emulsion maintained an effective control on azaleas for 11 days, showing that this spray was as effective under conditions in the commercial nursery as in the orchards.

Influence of the instars of host larvae on sex of parasite progeny.--M. H. Brunson, Moorestown, has recently completed a study of the interrelation between the instars of the Japanese beetle and its parasite, Tiphia popilliavora Roh. The study showed that the female parasite has the ability to control the sex of her progeny at the time of parasitization of the host larvae of different instars. Second- and third-instar host larvae are accepted by the parasite, third-instar host being preferred, and parasite development is completed on both. In a number of observations in which fertile female parasites were supplied with both second- and third-instar host larvae simultaneously, with second- or third-instar host larvae exclusively, and with second- and third-instar host larvae on alternate days, the resultant parasite progeny was predominantly males from the parasitized second-instar host larvae, while a normal sex ratio consisting of slightly more female than male parasites resulted from the parasitization of third-instar larvae. Definite proof that the female parasite has the ability to vary the sex of her progeny at the time of parasitization of the host larvae of different instars was obtained when parasite eggs placed by fertile females on second-instar host larvae were transferred to third-instar host larvae, and eggs placed on third-instar host larvae were transferred to second-instar host larvae. The resultant parasite progeny was predominantly males when parasite eggs were transferred from second-instar host larvae to third-instar host larvae, while a normal ratio of males and females resulted when the parasite eggs were transferred from third-instar host larvae to second-instar host larvae.

MEXICAN FRUIT FLY CONTROL

The fruit fly situation.--In the lower Rio Grande Valley 556 adult *Anastrepha ludens* Loew were trapped in January. Flies were taken on 188 premises in every district except one. Notwithstanding the apparent high fly population in the groves, regular grove inspections for larvae all gave negative results. Fruit shipments exceeded any previous month's total in the history of the citrus industry in this area. Over 4,300 equivalent carloads were moved by rail, truck, and boat. Approximately 40 percent of the crop remains to be harvested.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Difference in weight of borers from strains of borer-resistant corn.--In their 1936 experiments, L. H. Patch and G. T. Bottger, of the Toledo, Ohio, laboratory, found differences in the relative weight of European corn borer larvae dissected from the borer-susceptible corn strain, A X Tr, and the borer-resistant strain, R4 X Hy. Borers were dissected from 240 corn plants. The data obtained are summarized in the following table.

Date	:	:	:	:	:	:	:	Ratio-weight				
of	:	Age	:	Borers dissected:	:	Weight per	:	of borers from				
infes-	:	of	:	from--	:	borer from--	:	R4 X Hy to those				
tation	:	borers:	A X Tr	:	R4 X Hy	:	A X Tr	:	R4 X Hy	:	from A X Tr	
	:	Days	:	No.	:	No.	:	Centigram:	Centigram:	:	Percent	
July 3----	:	32.8	:	1495	:	615	:	5.7	:	3.8	:	66.9
Do-- 5----	:	34.8	:	1452	:	506	:	8.3	:	6.0	:	71.8
Do- 24----	:	34.8	:	3378	:	2608	:	10.7	:	8.3	:	77.2
Do- 9----	:	35.7	:	1523	:	707	:	10.4	:	8.2	:	79.2
Do- 22----	:	36.6	:	2675	:	1879	:	11.1	:	9.4	:	84.9
Do- 21----	:	36.7	:	2273	:	1383	:	11.3	:	8.8	:	78.2
Do- 20----	:	37.8	:	1526	:	885	:	11.2	:	8.8	:	78.5
Do- 17----	:	40.8	:	2487	:	1217	:	11.7	:	9.7	:	82.9
Do- 15----	:	42.6	:	2115	:	1038	:	12.3	:	10.3	:	83.4
Do- 13----	:	44.1	:	1795	:	951	:	12.3	:	10.7	:	86.7

It may be noted from the table that the mean weight of the borers hatching on July 3 on strain A X Tr was 5.7 centigrams when dissected 32.8 days later, and that the borers from strain R4 X Hy weighed 66.9 percent as much. When the dissection was made 44.1 days after hatching, the borers from A X Tr weighed 12.3 centigrams and those from R4 X Hy weighed 86.7 percent as much. In general, the older borers weighed more than the younger borers, irrespective of the date of hatching. Also, the difference between the weight of the borers in A X Tr and those in R4 X Hy decreased on a percentage basis as the weight of the borers from A X Tr increased. This was determined by noting that the ratios given in the table are larger for the greater borer weights; but, as the date of infestation is a variable, together with the age and weight of the borers, the cause for the decreased difference between the weight of the borers from A X Tr and those from R4 X Hy cannot be determined. One possible explanation is that as the borers from A X Tr became mature those from R4 X Hy tended to catch up in weight; therefore the differences between their weights become less.

Bruchid intercepted in vetch seed from Hungary.--J. S. Pinckney, of the Carlisle, Pa., laboratory, reports that another interception has been made of Bruchus luteicornis Illiger, found entering this country in vetch seed. In a sample of vetch seed inspected at Baltimore, Md., on September 4, 1936, a few seed of Vicia grandiflora were found among the V. villosa seed. One of the V. grandiflora seed was found to be infested by a bruchid identified by H. S. Barber as B. luteicornis. The host record is new to the museum; however the same species was recently intercepted by the Division of Foreign Plant Quarantines in the seed pods of V. angustifolia contained in the straw jackets used as packing in cases of Benedictine.

Predators destroy sawfly parasite.--According to C. C. Hill, Carlisle, examination of 100 cocoons of Heterospilus cephi Rohw., a parasite of the wheat stem sawfly, collected on January 22, 1937, on the National Farm School grounds in Bucks County, Pa., showed that 41 percent of the cocoons had been destroyed by predatory larvae of a species of Collops, as determined by A. G. Boving.

JAPANESE BEETLE CONTROL

Strawberry-plant inspection started.--Approximately 150,000 strawberry plants were inspected and certified for an Eastern Shore grower in January. It was necessary to wash the mud off the plants before inspecting them. Inspection of the washed plants showed that dipping was effective in ridding them of soil.

No emergence of adult Japanese beetles in greenhouses.--A survey of greenhouses in the Philadelphia area, where adult beetles can usually be found during the entire winter, failed to disclose any infestation in December or January. Prolonged infestation last fall, together with continued cloudy weather during December and January, is believed to be responsible for scarcity of the winter-reared adults.

Grower required to clean up uncertified dahlia clumps.--As a requisite for retaining their Class I status, two establishments in the New York district, that had purchased several thousand uncertified dahlia clumps, were obliged to free the clumps from soil and other refuse and burn the peat moss and dirt. The cleaning yielded 116 baskets of dirt and 15 barrels of a combination of peat, moss, soil, and sulphur.

Japanese beetle larvae overwintering near surface.--Reports from inspectors in central and southern New Jersey indicate that Japanese beetle larvae are very near the soil surface for this time of year. Three grubs were found at the crown of shrubs dug from nursery rows and offered for inspection after being made soil free. In connection with the inspection on January 7 of 150 lilac bushes, one larva was removed from a shallow cavity near the root crown of one of the plants.

Potato fumigation may increase.--Inquiries concerning the probable potato crop on the Eastern Shore of Virginia that may require fumigation prior to shipment to nonregulated territory elicits the information that the growers anticipate a 20-percent increase in the potato crop in that region during the coming season.

Exhibit for Sportsman's Show found to be infested.--Inspection by the district inspector at Portland, Maine, of the exhibit prepared by the State of Maine for display at the Sportsman's Show in the Grand Central Palace in New York City resulted in the finding of six gypsy moth egg clusters--three on beaver cuttings and one each on an old stump, a piece of old birch bark, and an evergreen. The inspected material consisted of several hundred living trees, old stumps and logs, several bushels of pine needles and other leaves, about 200 stones collected from and near mountain streams, an old beaver dam made of sticks and mud, several poplar and birch beaver cuttings, along with the cedar logs, 150-year-old hand-sawed boards and hand-split shingles used in the log cabin.

Christmas-tree inspection in 1936.--Final tabulation of the records covering Christmas-tree inspection during the past season shows that 640,685 trees originating in the lightly infested gypsy moth area were inspected and certified for shipment to nonregulated territory. This quantity represents an 8.5 percent increase over the number of trees inspected in 1935. An increased cut in the lightly infested section of Maine of approximately 51,000 trees accounted for the season's increase. Classified according to means of transportation, the Christmas-tree inspectors examined 236 carloads comprising 508,196 trees, and 132,489 trees transported by truck or in less than carload lots.

Nursery evergreens cut for Christmas trees.--Among Christmas trees inspected and certified under the gypsy moth quarantine regulations during the holiday season were 21,511 Norway spruce trees cut by a central Connecticut nursery for shipment to nonregulated territory. These trees were of the table-tree type, from 2 to 3 feet in height. The only gypsy moth infestation found during the Christmas-tree inspection was a single egg cluster taken from a balsam tree grown in a nursery in southern Vermont.

Quantities of egg masses removed from inspected products.--January was a banner month for quantities of gypsy moth egg clusters removed from products submitted for inspection. A total of 214 egg masses was removed from 39 inspected shipments.

Creosoting to prevent infestation of antiques.--An attempt is being made by the district inspector at Bangor, Maine, to have a large number of gypsy moth egg clusters on a few tall elm trees at Rockland, Maine, creosoted before hatching time. These heavily infested trees are located in front of an antique shop, where the antique pieces are scattered all over the dooryard to attract customers. Last summer several live pupae were removed from some old iron chairs that were in readiness for shipment to Illinois. By destroying this localized infestation, the chances of the antiques becoming infested during the coming summer will be greatly reduced.

Out-of-season shipment from New England.--In southern New Hampshire 200 birch trees were dug on January 17 and, after inspection and certification, were shipped to Ohio. Usually in this section the frost is several feet deep in the ground during the entire month of January and the digging of nursery stock is out of the question. There has been little ice or snow in this part of New England this winter.

Rain hampers elm-sanitation workers.--Rainy days in each week of the month hampered field workers and curtailed the number of dead and dying elm trees that ordinarily would have been removed by the force of approximately 3,800 W. P. A. laborers engaged in this phase of the eradication project. In some sections of the infected zone the time lost in January made it impossible for even those W. P. A. workers who performed services on every suitable working day during the period to complete 16 days within the month. This is the first month this condition has occurred. Chemical-treating crews operating in the Branford, Conn., district were also hampered, as the treatments for which permissions were on file were in swamp areas in which treating was scheduled to be done while the swamps were frozen or while the men could reach the trees. The swamps remained unfrozen all month, with water too high for men to reach the elms, even with hip boots.

Dutch elm disease camps rank high.--According to the January report of the Department of Conservation and Development for the E. C. W. Camps in the State of New Jersey, the three C. C. C. camps assigned to Dutch elm disease eradication in the State ranked first, seventh, and twelfth among 22 camp units in the percentage of men released to the project superintendent for field work. The highest ranking camp had a daily average strength of 159 men for the 20 authorized working days in January. Seventy-five percent of the men, all of whom were used, were released to the project superintendent. Twenty-five enrollees were retained by the camp commander, 24 for regular overhead and one for conditioning. Fourteen men were sick or on leave.

Tree-medication activities.--By the end of January bands of powdered copper sulphate had been applied to 402,004 elms in areas in which permission for chemical treatment or removal of all elms therein had been granted. The weekly production was in the neighborhood of 25,000 trees. Late in January four men devoted an entire day to sampling trees that were chemically treated on November 20 at Branford, Conn. In practically all trees discoloration from copper sulphate was generally distributed into the root systems and into the aerial portions for distances of 20 or more feet above the bands.

Non-Dutch elm disease camps assist in sanitation.--Two New York C. C. C. camps, working under the supervision of the Westchester County Park Commission, assigned crews to assist in the sanitation work. The Mohansic C. C. C. camp made final arrangements for their work and began cutting on January 16. The Poundridge Reservation camp was well along in its work on the reservation by mid-January. One Federal man was furnished to each camp to assist in organizing the work.

FOREST INSECT INVESTIGATIONS

Killing undesirable trees with poison.--The Morristown, N. J., laboratory is experimenting with the introduction of certain poisonous chemicals into standing elm trees for the purpose of ascertaining how undesirable trees may best be killed and bark beetle attack prevented. In sampling wood from treated trees it is necessary to take increment cores which are later tested for the quantity and distribution of the chemicals. In making the tests the cores must be cut into thin slices so as to facilitate extraction of the chemicals. A. E. Lantz, of the laboratory staff, has developed a machine with which cores can be rapidly sliced.

Parasite to be sent to Puerto Rico.--P. B. Dowden and P. A. Berry, of the New Haven, Conn., laboratory, report as follows: "A collection of the golden oak scale (Asterolecanium variolosum (Ratz.)) was obtained in the vicinity of New Haven and sent to C. P. Clausen, of the Division of Foreign Parasite Introduction. This shipment will be forwarded to Puerto Rico where it is hoped that a colony of the parasite Habrolepis dalmani West. will be obtained for liberation against the bamboo scale (Asterolecanium bambusae Boisd.). A small sample held at New Haven at a temperature of 70° F. and a relative humidity of 72 percent produced 10 Habrolepis adults between January 25 and 31."

Parasitization of elm leaf beetle.--Mr. Berry reports as follows on Tetrastichus brevistigma Gahan, a pupal parasite of the elm leaf beetle, which has been studied since 1932: "Parasitization of beetle pupae has remained high during the 5-year period including 1936. The elm leaf beetle population, however, was much lighter in 1936 and at some of the liberation points it was difficult to get a collection of 100 pupae at the time the collections were made on August 4. The high parasitization, together with other factors yet unknown, have probably been instrumental in decreasing the population of this beetle."

Pine beetles suffer heavy mortality from cold.--F. P. Keen, of the Portland, Oreg., laboratory, reports that for the third winter in 5 years extremely low temperatures in eastern Oregon, Washington, and northeastern California have taken a heavy toll of overwintering broods of the western pine beetle (Dendroctonus brevicomis Lec.). This latest winter killing occurred in early January 1937. To determine how wide a range of minimum air temperatures might occur over a comparatively large forested area served by one standard weather station and how generally effective a period of cold weather might be in reducing western pine beetle broods, an experiment was set up on the Ochoco National Forest of eastern Oregon in the fall of 1936. After the recent cold wave 132 minimum-temperature thermometers used in this study were read. Temperatures ranged from 15 to 36° below zero, the coldest places being in valleys and the warmest on the tops of high ridges. Preliminary analysis of infested bark samples from this area showed a kill of approximately 45 percent of the brood, about 10 percent less than had been anticipated from earlier studies. Widespread winter killing of overwintering pine beetle broods during recent years is as effectively controlling this timber pest as though many thousands of dollars had been spent in felling and burning the infested trees.

Mountain pine beetle infestation on the Beaverhead National Forest ended.--A. L. Gibson, of the Coeur d'Alene, Idaho, laboratory, reports that the severe mountain pine beetle epidemic which invaded the Big Hole Basin of the Beaverhead National Forest in 1926 has run its course, leaving in its wake many square miles of devastated lodgepole forests. The infestation reached its peak in 1931, with 12,636,527 trees being attacked. Owing to a decreasing supply of host material in 1932, there was a slight drop in the severity of this outbreak to 10,160,844 attacked trees. A further decline expected in 1933 was augmented in the winter of 1932-33 by severe cold, which destroyed a large percentage of the overwintering broods. The light

infestation during the summer of 1933 was followed by very few attacked trees in 1934 and none in 1935 and 1936. Data from annual surveys show that in the past decade, during which the epidemic swept through the Big Hole Basin, nearly 31,000,000 trees, or about 60.2 to each acre of land, were killed by the mountain pine beetle. In addition to this loss, about 10,000,000 trees were killed by secondaries, which are always associated with such epidemics. As a result of these serious losses, practically all the larger trees have been destroyed, although a surprisingly large number of small trees still remain as a nucleus for a second crop.

Dry sites unfavorable to mountain pine beetles.---J. C. Evenden reports that during the 1936 season the Coeur d'Alene laboratory made use of a small crew of C. C. C. boys to study the mountain pine beetle infestation on the Coeur d'Alene National Forest. The object of this study was to obtain a better understanding of the factors that govern the behavior of mountain pine beetle infestations in western white pine. W. D. Bedard is now analyzing the data and he reports on an interesting correlation which shows that on dry sites barely sufficient brood is produced to maintain the infestation. These data are summarized in the following table.

Site :	Total	Average:	Average per square foot			
con- : Trees :	bark	infested:	of bark			
dition : sampled:	surface	bark per:	Brood	Attacks	Parasites	Predators
		tree :				
	Number	Square feet	Sq. ft.	Number	Number	Number
Wet----	46	10,377	225	50.9	7.4	6.2
Medium :						
wet---	86	15,852	184	41.5	7.3	3.0
Dry----	80	13,191	164	14.8	6.8	2.7
						1.3

It is at once apparent from the preceding table that, although the number of attacks per square foot is approximately equal on all three sites, there is a greater brood survival on wet sites and a greater amount of infested bark surface per tree, thus making a much greater total brood per tree than on dry sites. This is comparable with conditions known since 1925 to exist with regard to brood survival of the Black Hills beetle. In addition, although beneficial insects are more numerous on wet sites, they represent a greater proportion of the population on the dry sites. This fact is of practical application, not only in determining which areas need control but also on those control projects which because of snow and inclement weather are unable to complete work before brood emergence in the spring. Under these circumstances, the control administrator can direct the work during the remaining time into areas where the control will be of greatest benefit.

Educational material on termite control.---R. A. St. George, of the Washington, D. C., office, says that during the latter part of January a termite exhibit prepared by the Bureau in cooperation with the Office of Exhibits of the Extension Department for use in State Fairs was completed and released. Also, during this time the Bureau's revised film strip on termites

was released. It contains considerable new material relating to the biology and methods of control of termites and places special emphasis on proper construction of buildings for permanent protection from termite attack. It is suitable for presenting a talk of about an hour's duration on the subject.

White grubs and vegetation.--The Milwaukee, Wis., laboratory has been conducting a study of white-grub populations as correlated with various vegetational cover types. A preliminary report from Lee E. Yeager indicates that on the Huron National Forest in Michigan the largest population of Phyllophaga grubs are found where oak trees are present in the cover type. The genus Serica was found to be most abundant in the aspen and aspen-birch types. Grubs of the genera Phyllophaga and Serica are the most destructive to young trees in coniferous plantations. The foliage of the above-mentioned broadleaf trees is preferred as food by the adult beetles of many of the species of these two genera, and this food relationship appears to be very important in determining the local distribution of the grubs.

PLANT DISEASE CONTROL

Summary of barberry eradication during 1936.--A total of 68,550,918 barberry bushes were destroyed on 11,566 properties in 17 States. In the following table these figures are shown by States, together with the quantity and kind of chemicals used.

State	:	:	Barberry	:	Chemicals used		
	:	Properties:	bushes	:	Salt	Kerosene	Atlacide
	:	cleared	destroyed	:	:	:	:
	:	Number	Number	:	Tons	Gallons	Pounds
Colorado-----	:	72	1,657,038	:	23.00	0	5,000
Illinois-----	:	955	11,569	:	26.00	0	0
Indiana-----	:	447	17,844	:	15.25	56	0
Iowa-----	:	729	15,993	:	79.26	235	0
Michigan-----	:	1,405	201,234	:	246.99	175	0
Minnesota-----	:	611	10,629	:	53.32	0	0
Montana-----	:	48	664	:	1.25	0	0
Nebraska-----	:	129	660	:	3.79	0	0
North Dakota---	:	27	4,165	:	1.37	0	0
Ohio-----	:	1,098	244,017	:	143.95	0	0
South Dakota---	:	11	51	:	.32	0	0
Wisconsin-----	:	680	33,968	:	44.82	0	0
Wyoming-----	:	0	8	:	0	0	0
Missouri-----	:	785	8,804	:	4.71	0	0
Pennsylvania---	:	2,561	2,788,690	:	1,048.96	0	0
Virginia-----	:	1,223	44,961,117	:	996.98	0	0
West Virginia---	:	785	18,594,467	:	1,239.04	0	6,000
Total-----	:	11,566	68,550,918	:	3,929.01	466	11,000

The figures in Virginia, West Virginia, and Colorado are hardly comparable with those in other places, because the work in these States has been largely in areas where native species of barberry are prevalent. In Virginia and West Virginia Berberis canadensis is being eradicated in the important grain-growing communities, whereas in Colorado the presence of B. fendleri in the San Luis Valley and San Juan Basin has been responsible for severe rust losses in past years. Emergency funds have been used to employ labor to bring these bushes under control in communities where small grains are important. Field work was continued throughout January on a somewhat reduced basis in 12 of the 17 States participating in the program, with minor interruptions because of inclement weather, that is, by heavy rain and snow in the central and northern States. Altogether, 2,200 men were given full-time employment, and reports from field offices indicate that the effectiveness of the work was comparable to that conducted during the late-summer and fall months. Barberry bushes may be treated with salt just as effectively when the ground is frozen as during the growing season.

Eradication of European black currants in Ohio.--A summary of the eradication work in connection with white pine blister rust control in Ohio shows that excellent cooperation was received from owners of European black currants in 24 counties during 1935-36. The numbers of plantings destroyed are shown in the following table.

Type of planting	Cooperation given through				Verbal		Per-	
	Signed	Verbal	Destruction	Sub-	No	or	cent	
	release	consent	by owner	total	report	written	Total	total
	:	:	:	:	:	:	:	:
Noncommercial	:	:	:	:	:	:	:	:
(1-20 bushes)---	4,575	487	170	5,232	372	63	5,667	91.5
Semicommercial	:	:	:	:	:	:	:	:
(21-100 bushes):	383	48	8	439	21	15	475	7.7
Commercial	:	:	:	:	:	:	:	:
(101-2000 bushes)	39	8	1	48	:	2	50	.8
Total-----	4,997	543	179	5,719	393	80	6,192	100.0
Percentage of	:	:	:	:	:	:	:	:
total-----	80.7	8.8	2.9	92.4	6.3	1.3	100	--

Skilled security wage earners employed on emergency funds were used to locate these plantings and to contact the property owners for permission to eradicate the bushes. The bushes were destroyed under authority of State laws administered by the Ohio Department of Agriculture. Infected bushes were found in seven counties in northeastern Ohio in 1935, but no infected bushes were found in 1936. European black currants evidently are not of much commercial importance, as 48 out of 50 growers, whose plantings were classed as commercial, consented to their removal. Noncommercial plantings averaged 5.1 bushes, while semicommercial plantings averaged 36.9 bushes and commercial plantings averaged 260.4 bushes per location. The table shows that 92.4 percent of the owners willingly gave their consent for the removal of their cultivated black currants, indicating the excellent

cooperation received from the owners in this work. The locations listed under the heading "no report" include bushes found on vacant lots and abandoned properties where the owners could not be located and the plants were evidently growing wild.

Minnesota blister rust control law upheld.--The State blister rust control law and supporting regulations of Minnesota were recently upheld in district court in Duluth, in the case of W. O. Bissonett vs. E. V. Willard and D. M. Stewart. Judge C. R. Magney issued a temporary order on September 23, 1936, requiring the defendants, the Commissioner of Forestry and Fire Prevention of Minnesota and one of his deputies, to show cause why an injunction should not be issued restraining them from removing and destroying eight cultivated currant bushes growing on Mr. Bissonett's premises. After holding a hearing on October 9 and taking the case under advisement, the original restraining order was vacated on January 5, 1937. The judge's memorandum indicates that he relied largely on the decision of the Supreme Court of the United States in *Miller vs. Schoene*, 276 U. S., 272, in which the cedar-rust statute of Virginia was upheld in 1927. In addition, Judge Magney supported the reasonableness of the original order for the destruction of the *Ribes*, saying, "The value of the bushes is very small compared with the value of the 392 white pine trees (within infecting range) which they may destroy." He quoted the United States Supreme Court in the case just mentioned: "When forced to make the choice, the State does not exceed its constitutional powers by deciding upon the destruction of one class of property in order to save another which, in the judgment of the legislature, is of greater value to the public." The destruction of a number of other cultivated currant and gooseberry plants at Duluth had been delayed pending the decision in this case.

Various types of injury reported among blister rust control personnel.--During the period July 1935 to October 15, 1936, the blister rust control personnel in the Northeastern region reported 339 injuries. During this time the maximum number of men employed on the blister rust project in the region was 4,555, while the total number of man-days of labor expended was 514,131. The injuries were classified as follows: 113 cases of poison ivy, 50 infections, 3 cases of blood poisoning, 7 fractures, 106 sprains and bruises, and 60 cases of organic trouble.

COTTON INSECT INVESTIGATIONS

Cotton boll injury by hemipterous insects.--T. P. Cassidy and T. C. Barber, Tucson, Ariz., report that the results of field-cage tests again show that the pentatomid *Euschistus impictiventris* Stal is the most important of the hemipterous insects that puncture cotton bolls in the Salt River Valley of Arizona. More than 90 percent of the bolls in the cages with this species were punctured and most of them were so severely injured as to render them unpickable. *Chlorochroa sayi* Stal was again the second most serious species. Each individual *C. ligata* Say is equally as injurious as *C. sayi* but has occurred in such limited numbers in Arizona during recent years to be of relatively little importance as a pest in that area. The pyrrhocorid *Euryophthalmus succinctus* (Linn.), has often been suspected of being injurious to cotton because it frequently appears in numbers in the

cotton fields late in the summer, but the evidence obtained thus far indicates that this species does not puncture cotton bolls. In two cages in which E. succintus was confined with cotton plants no bolls were punctured. The mirid Creontiades femoralis Van D., may deserve attention as a cotton pest, as 58 percent of the bolls in two cages with this species were punctured, but with practically no lint staining. In the cages in which Dysdercus mimulus Hussey, Thyanta custator Kirk., and Lygus spp. were isolated, from 18 to 62 percent of the bolls were punctured, accompanied with light lint stains. In connection with a State-wide survey, concluded during November 1936, of hemipterous cotton insect injury, laboratory examinations were made of 41,500 cotton bolls of Upland cotton collected from 58 cotton fields in 5 Arizona counties, including all of the main cotton-growing areas of the State. Of these, 24.18 percent were found to be punctured. Of long-staple cotton, 12,500 bolls were examined from 15 fields in 4 counties and 6.13 percent were found to be punctured. The intensity of infestation and the extent of damage to cotton bolls by hemipterous insects by counties was similar to results obtained by surveys made during the two preceding years. For the third consecutive year Yuma County showed the greatest damage, with an average of 58.34 percent of the bolls punctured; Maricopa County again ranked second, with an average of 39.71 percent of the bolls punctured; and Pima County continued to have the lightest damage, with only 7.12 percent of the bolls punctured. In all 3 years the percentage of bolls punctured in Graham and Pinal Counties has been between that in Maricopa and Pima Counties. Field examinations were made on November 25-30 by L. D. Christenson, after frost had defoliated the plants (the first killing frost was on the night of November 3), and there were very few green bolls on which the insects could feed to determine the pentatomid population. In the four cotton fields examined only one specimen was taken on the plants. The others were found under leaf trash and clods and in soil crevasses. Observations were made during the warmest part of the day, when it was expected that the insects might be active. E. impictiventris and C. sayi were present, the former predominating. Ten pentatomids were found in 105 square yards examined, which indicates an average of 458 per acre. This is approximately one-third the maximum density of boll-puncturing pentatomids noted in the same fields last summer. In nearby fields containing "islands" of green--unfrozen cotton with green bolls suitable for food--both E. impictiventris and C. sayi were active and feeding on warm afternoons during this period.

Cotton variety tests for reducing pink bollworm damage.--In tests conducted at Presidio, Tex., in 1935 by S. L. Calhoun it was found that none of the cotton varieties tested exhibited any noticeable resistance to pink bollworm attack. Information gained from the work indicated, however, that some of the varieties had growth and fruiting characteristics and that certain cultural practices might be of importance in reducing the damage. The Acala strains of cotton, which are almost exclusively grown in the Big Bend district, produce large, spreading plants and large bolls, continue fruiting over a long period, and mature slowly, giving favorable environment for pink bollworm development. During 1936 tests were continued with four eastern varieties representing the small boll, fast-maturing types

developed for use under boll weevil conditions. Blooming began on all the varieties by June 15, but the eastern varieties reached the peak of blooming and set their bolls considerably earlier than did the Acala. From July 20 to September 16, the percentage of green bolls infested and the number of worms per boll were determined. At the first two examinations made on July 20 and August 3, the percentage of boll infestation was low, the number of worms averaging less than one per boll in all the varieties. There was a large increase by August 17, and on August 31 all the varieties had 100-percent infestation of the green bolls that were from 30 to 35 days old. At this last examination the average number of worms per boll ranged from 13 to 19 in the eastern varieties and 29 worms per boll in the Acala. The difference in intensity of infestation in the large-bolled Acala and small-bolled eastern varieties was not due to any observed resistance but was possibly because of the greater amount of food available in the larger bolls. These seasonal records emphasize the importance of having as large a part of the crop as possible picked prior to the increase in infestation. At the first picking on August 24 the four eastern varieties yielded from 61 to 66 percent of their total crop and the Acala 56 percent. Very few of the bolls that opened on this date had been subjected to heavy infestation and had suffered only moderate damage, whereas the last picking was severely damaged. The total yields of the four eastern varieties ranged from 2,207 to 2,488 pounds of seed cotton per acre and the Acala only 1,772 pounds. In another series of spacing tests, all varieties set their crop 2 weeks earlier and produced about 25 percent more cotton at the first picking when spaced 12 inches apart than when left 30 inches in the drill, as is customary in this section. Earlier maturity from improved varieties and better cultural practices will also permit the fields to be cleaned earlier than has been possible formerly, thereby reducing considerably the number of larvae that enter the ground for hibernation.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL.

Laboratory inspection.--The inspection of green-boll samples collected last fall has been going forward at the San Antonio laboratory for about a month. The material thus far inspected was collected outside regulated areas and results have been negative. Practically all of the material collected within regulated areas is inspected at the various field stations after the ginning season is completed. A small quantity of material has been inspected in the lower Rio Grande Valley of Texas and one pink bollworm larva was found in Cameron County.

The situation in the Big Bend.--Clean-up in the Big Bend district of Texas was discontinued the latter part of December. During the first part of January experiments were continued with the development of a machine to burn material in cotton fields. In a final test with four of these machines, a field containing 8.67 acres was completed in 4 days and 2 hours at a considerably lower cost than by the old method of using hand labor. Apparently a very substantial saving can be made in any future clean-ups and a far more efficient job can be done. Briefly, the machine consists of a hood 3 by 4 feet, with a wire grate of 1-inch mesh in the bottom about 4 inches from the ground. In front there is a small platform to facilitate

firing. On the side is a removable guard to prevent stalks and bolls from falling off on the side opposite the workman, and on the sides of the machine and at the rear is a piece of sheet metal set vertically about 3 inches from the sides with both top and bottom open for the purpose of pulling the flame to the ground. The apparatus is equipped with small wheels in the rear and a handle to pull the machine along. The machine can be operated by one man, and it uses the dry cotton stalks for fuel.

Thurberia-plant eradication.--The eradication of Thurberia plants in the Santa Catalina Mountains of southern Arizona has not made as rapid progress as during previous months. This was due to heavy snows. Although the acreage covered was only one-third of that covered the preceding month, nearly 8,000 more Thurberia plants were destroyed, the data for January showing 1,040 acres worked and 47,979 Thurberia plants destroyed.

Wild cotton eradication.--Considerable progress has been made with the eradication of wild cotton in southern Florida. By the end of January all of the west coast above Cape Sable had been recleaned at least once since work was begun in the fall and a considerable part had been gone over a second time. All of the keys south of Key Largo and all but a small part of the large cotton area on Key Largo had been recleaned. On Cape Sable a considerable area has been gone over. Several small outlying colonies in Brevard County, on the east coast, and a similar colony in Pasco County, on the west coast, have been recleaned. When a considerable number of wild cotton bolls are encountered they are placed in preservative for later inspection, in order to obtain information on the status of infestation. When only a small number of bolls are present they are examined as the cotton is destroyed. A considerable number of bolls has been inspected on Cape Sable with negative results, but on Lower Matecumbe Key 250 bolls were inspected and 22 pink bollworm larvae were found in 15 of the bolls.

Road-station inspection.--During January, 5 of the cars inspected at the Marfa, Tex., road station were found to be carrying contraband material. Only one of the interceptions was found to be infested, this being one living pink bollworm larva found in two locks of seed cotton taken from a pick sack. Inspectors on duty have requested various persons in the area to advise any of their friends leaving the area not to carry contraband material. The fact that so few interceptions were made indicates that this word has been passed around.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Cryolite leaves no harmful residue on canned lima beans.--L. W. Brannon, of the Norfolk, Va., laboratory, reports that the results of an experiment conducted at Easton, Va., in 1936 to determine the relative effectiveness of various insecticides for the control of the corn earworm (*Heliothis obsoleta* Fab.) on lima beans, disclosed that the best control was obtained with cryolite (synthetic) dusts and cryolite sprays, the former being applied either as an undiluted dust or at the rate of 60 parts of cryolite diluted with 40 parts of talc or sulphur. As a spray, the cryolite

was used at the rate of 3 pounds to 50 gallons of water. In addition to reducing the number of wormy pods as compared with untreated plots, applications of cryolite dusts and sprays increased the total number of pods produced, demonstrating that protection was afforded against the shedding of the young or small pods caused by corn earworm injury. In general, these results confirmed those obtained in similar experiments in 1935. Phenothiazine gave good protection against worm injury, but failed to show a significant increase in the number of pods produced over the untreated plants. Copper cyanide, used as a spray, gave no control and caused a slight reduction in the number of pods produced, as compared with untreated plots. Negative results were obtained with various dust mixtures of derris, cube, pyrethrum, nicotine, and sulphur. The Insecticide Division of this Bureau conducted analyses of samples of shelled and unshelled lima beans from plots that had been treated with cryolite and found that the fluorine residue remaining on the unshelled beans (pods) was in many instances above the tolerance established for fluorine on fruit (0.01 grain per pound). Analysis of the shelled beans, however, showed in most instances that the quantity of fluorine on such beans was well below 0.01 grain per pound. Analyses were also conducted of canned beans from cryolite-treated plants that had been run through the commercial process of vining and canning. The results of the analyses of this product indicated that when lima beans are treated as described above and run through the ordinary washing process the canned product is free from harmful fluorine residues. Also, a sample of shelled beans taken just after they came from the viner, without washing or other treatment, contained a surprisingly small quantity of fluorine. As lima beans are shelled before human consumption, it appears that cryolite may be safely applied for the control of the corn earworm on this crop.

Average yield does not always indicate leafhopper populations.--That the average yield of sugar beets is not always an indicator of populations of the beet leafhopper was disclosed in a report submitted by J. R. Douglass, of the Twin Falls, Idaho, laboratory. In comparing yields of sugar beets in south-central Idaho in 1935 and 1936, it was found that the average yield per acre in 1936 was approximately 12.7 tons, as compared with 13.7 tons in 1935. The season of 1936 was one of relatively low leafhopper populations, whereas the 1935 season was one of relatively high leafhopper populations. There was also an increase in the beet acreage in south-central Idaho of approximately 13,000 acres in 1936, as compared to that of 1935. To obtain such an increase in acreage, it was necessary for the sugar companies to contract with a large number of growers who had had no previous experience in growing sugar beets. It seems probable, therefore, that the decrease in yield per acre for the 1936 crop can be attributed more directly to the inexperience of some of the growers than to the variation in beet leafhopper populations in the 2 years involved.

Location of infested pods influences pea weevil mortality.--As a result of observations recently completed by T. A. Brindley, of the Moscow, Idaho, laboratory, it was ascertained that pea weevils present in pods resting on dead weeds or on the soil surface suffered nearly 100-percent mortality under the conditions that ordinarily prevail in the fields after

green peas have been harvested for canning. Weevils present in pods shaded by weeds, in pods suspended just above the soil surface, or in pods in dried refuse from the viner suffered little mortality. It was found also that weevil mortality was low in pods on top or within small piles of vines. In pods that were partly in contact with the soil surface, the mortality was greater. No weevils survived in pods located at a depth of 1 foot in stacks of green viner refuse.

Development and mortality of predaceous pentatomids vary with kind of food taken.--As a result of experiments performed by B. J. Landis, of the Columbus, Ohio, laboratory, it was determined that the rate of development and the degree of mortality among sets of nymphs of Podisus maculiventris Say and Perillus bioculatus Fab., reared on several hosts and under comparable conditions in the insectary, appeared to depend on the kind of food taken. Insect eggs were most nourishing and were followed in the order of value by larvae of different hosts, depending on their metabolic rate. Hosts of the same species, but reared on different food plants, caused considerable variation in the rate of development and in the relative mortality of the predatory nymphs. The nymphs died more rapidly when the rate of development was slow. Certain substances transmitted from the plant through the host to the predator apparently caused many nymphs to die, yet in some instances this influence did not affect the rate of development of the surviving individuals.

Inverse relationship between temperature and incubation period of tobacco hornworm.--During the course of experiments performed at the Quincy, Fla., laboratory, A. H. Madden found that an inverse relationship existed between the prevailing temperature and the duration of the incubation period of Protoparce sexta Johan. In May, when the daily mean temperatures approximated 76° F., the incubation period averaged approximately 5 days, whereas in June, July, and August, when the daily mean temperatures ranged from 76° to 86°, there was a corresponding decrease in the duration of the incubation period of from 1 to 2 days.

Weather favors celery leaf tier but other factors prevent outbreak in Florida.--C. F. Stahl, of the Sanford, Fla., laboratory, reports that, although weather conditions this winter have been favorable for the development of an outbreak of the celery leaf tier (Phlyctenia rubigalis Guen.), only a few moths were found in celery fields in January. This failure of the celery leaf tier to develop destructive populations in the presence of favorable climatic conditions is believed to be due to a very sparse initial population of the insect at the beginning of the season and a heavy harvest of the early celery crop, so that the small brood on that crop had but little chance to increase in abundance. The harvest of large acreages of mature celery early in the season decreased very decidedly the quantity of the crop available for oviposition by P. rubigalis and the early date of harvest assures that a large number of eggs and small larvae have been shipped to market instead of maturing in the fields, because the adults ordinarily seek advanced celery for oviposition.

Two species of aphids associated with narcissus mosaic.--F. S. Blanton, of the Babylon, N. Y., laboratory, reports that recent tests have led to the conclusion that the bean aphid (Aphis rumicis L.) and the rose aphid

(Macrosiphum rosae L.) are definitely associated with the transmission of the virus causing narcissus mosaic. A. rumicis gave a transmission record in each of six tests ranging from 33 to 100 percent, and M. rosae gave a transmission record in each of four tests ranging from 50 to 85 percent.

INSECTS AFFECTING MAN AND ANIMALS

Overwintering of primary screwworm fly.--Observations made at Uvalde, Sonora, and Menard, Tex., Valdosta, Ga., Gainesville, Fla., and Tempe, Ariz., show that larvae and pupae of Cochliomyia americana Cushing and Patton have been able to survive the low temperatures so far this winter in these localities. A minor outbreak of screwworms in range livestock occurred at Uvalde from December 27 to January 14. It was estimated that from 400 to 500 animals became infested during this period. A few infestations were observed in the vicinity of Valdosta about the middle of January.

Rotenone appears to be effective larvicide against cattle grubs.--R. W. Wells, Ames, Iowa, submits the following table showing results of preliminary tests at Colorado Springs, Colo., in which rotenone, derris powder, and devil's-shoestrings were used against larvae of Hypoderma lineatum De Vill. encysted in the backs of cattle.

Method of treatment	Composition of solution				Animals treated	Larvae treated	Larvae surviving	
	Oil	Cresol	Benzol	Rotenone	Number	Number	Number	Percent
	cc	cc	cc	Grams				
External---	45	5	50	3.0	14	317	10	3.15
Injection--	45	5	50	1.0	4	115	7	6.08
Injection--	70	5	25	1.5	2	52	4	7.67
Injection--	70	5	25	.5	9	211	11	5.21
Injection--	70	5	25	1.0	20	234	17	7.26
Injection--	70	5	25	.5	7	135	15	11.11
		Cresol:						
		com-						
		pound						
Injection--	45	5	50	.5	10	202	31	15.34
		Cresol:						
		com-						
		pound						

Four animals were treated externally with undiluted cracca at the rate of 3 ounces per animal (1.72 percent rotenone), with the result that of the 288 encysted larvae 250, or 86.8 percent, survived. On one animal given an external application of 3 ounces of undiluted derris powder (3 percent rotenone), 46, or 51.11 percent, of the 90 encysted larvae survived.

White-footed mouse resists heavy infestations of American dog tick larvae.--C. N. Smith and Helen Louise Trembley, Washington, D. C., in studying the biology of the American dog tick have found that a total of 846 larvae of this tick were able to complete engorgement on a young white-footed mouse (Peromyscus leucopus noveboracensis Fischer). This is the largest number of seed ticks they have ever reared on any species of wild rodent host without causing its death.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Six living larvae of the fruit fly Anastrepha suspensa (Loew) were intercepted at San Juan, P. R., on October 28, 1936, in guavas in baggage from the Dominican Republic. Twenty-nine living larvae of the melon fly (Bactrocera cucurbitae Coq.) were intercepted at San Francisco on November 15, 1936, in green string beans in ship's stores from Hawaii. Living specimens of Dicaiothrips angusticeps Crawford were taken on pineapples as follows: At New Orleans on April 28, 1936, in cargo from Cuba; at Brownsville, Tex., on May 27, 1936, in baggage from Mexico; and at Nogales, Ariz., on June 9, 1936, in cargo from Mexico. These represent the first records in our files of this thrips being intercepted. Two living larvae of the turnip mud beetle (Helophorus rugosus Ol.) were found at New York on November 25, 1936, on a white turnip root in ship's stores from France. A living larva of the olethreutid Talponia batesi Heinrich arrived at El Paso, Tex., on November 15, 1936, in a cherimoya (Annona cherimola) fruit in baggage from Mexico. Living larvae of the potato weevil Epicaerus cognatus Sharp were intercepted at Del Rio, Tex., on November 1, 4, and 7, 1936, in potatoes in baggage from Mexico. Living specimens of Taeniothrips atratus Hal., Thrips flavus Sch., and Thrips fuscipennis Hal. arrived at Boston on August 23, 1936, on carnation cuttings in baggage from Ireland. Living larvae of the turnip gall weevil (Centorhynchus pleurostigma Marsh.) were taken at Philadelphia on November 15, 1936, in turnips in ship's stores from the Netherlands. Living larvae of the same weevil were intercepted two days previously at New York in a turnip in ship's stores on the same ship from the Netherlands. A living adult of the chrysomelid Lema melanopa (L.) was found at Baltimore, Md., on November 23, 1936, on a spruce spray in the mail from Germany. A living adult of the coccinellid Epilachna varivestis Muls. arrived at Brownsville, Tex., on a chrysanthemum in cargo from Mexico. Two living adults of the hairy-vetch bruchid (Bruchus brachialis Fahr.) were taken at New Orleans on November 21, 1936, in vetch seed in cargo from France. A living specimen of Hercothrips errans Williams was intercepted at Washington, D. C., on September 29, 1936, on an orchid (Cattleya bertheuana) in express from England. J. C. Crawford reports that this species was described as Heliothrips but belongs to the segregate Hercothrips.

Potato used as oil-can stopper contains weevil.--A California car, coming from Mexico City recently, arrived on the bridge at Laredo, bound for California. In the trunk of this automobile a reserve supply of gasoline was carried in a 2-gallon oil can, on the spout of which an Irish potato had been stuck to avoid wasting the contents of the can. The Plant Quarantine Inspector on duty took up the potato and supplied a cork instead. From this potato four living larvae of the potato borer (Epicaerus cognatus Sharp) were taken.

Guavas found under upturned basket in truck.--A large truck with sides almost as high as a man's head, the type ordinarily used in hauling fruits and vegetables out of the Rio Grande Valley, arrived on the Bridge at Laredo, Tex. A young Mexican man was in the truck body, in which also reposed a number of fruit hampers and baskets. The plant quarantine inspector climbed upon the side of the truck and told the Mexican to move the baskets around so

that he could see if there was anything in them. The Mexican readily complied, moving them around and showing the inspector that they contained "nada! nada!" The inspector noticed that there was one turned upside down in the middle of the truck which the Mexican pushed around, but was careful not to turn over. Noticing this, he pointed out this basket and demanded that the Mexican turn it over. With some reluctance he complied, and underneath was a paper bag containing 17 guavas. A fine of \$2 for attempted petty smuggling was assessed by the Bureau of Customs.

Pests travel in trailer.--An automobile with house trailer attached arrived on the bridge at Laredo. In the trailer stores 11 oranges and 15 Irish potatoes remained. Two of the oranges were infested with fruit fly larvae, and a potato borer was taken from one of the potatoes.

Pathological interceptions of interest.--Botrytis vulgaris Fr. (Polyactis vulgaris Lk.) was intercepted on chestnuts from Italy on December 9 at New York. Cercospora chrysobalani E. & E. was collected in the field in Puerto Rico on July 21, 1936, on Chrysobalanus icaco, apparently the first report of this disease in Puerto Rico. Colletotrichum nigrum E. & H. was intercepted from Greece for the first time on January 27 at Norfolk on green hot peppers. Diplodiella goetheana Trav., first interception, was found on Chamaerops humilis leaves from Italy on September 16 at New York. Gloeosporium sp., apparently an abnormal strain of Glomerella cingulata (Ston.) Spauld. & Schrenk, was intercepted at Philadelphia on December 28 on an apple from Japan. The same apple was infected with an active decay organism closely resembling Sclerotinia fructicola (Wint.) Rehm. Helminthosporium torulosum (Syd.) Ashby was intercepted from Cuba for the first time on August 19 at New York on plantains. Leptothyrium pomi (Mont. & Fr.) Sacc. was intercepted from Africa for the first time on January 13 at Philadelphia on an apple from Morocco. Metarrhizium anisopliae (Metsch.) Sor., first interceptions, was collected at New Orleans on November 23 on an undetermined adult insect and on December 7 on an adult roach accompanying cargo from Honduras or Panama. Phomopsis capsici (Magn.) Sacc., first interceptions, was found on peppers from Mexico on November 3 and from Cuba on January 11 at New York. Phyllosticta sp. was intercepted on Arachis glabrata from Brazil on July 31, 1936, at the Inspection House in Washington. There does not appear to be any Phyllosticta listed as occurring on Arachis. Puccinia sp., intercepted on bamboo leaves from China on November 25 at San Francisco, proved to resemble two or three species but did not really fit any described species of rust. Sclerotinia laxa Aderh. & Ruhl was intercepted from Italy for the first time on January 10, causing a rot of apple. Sclerotium oryzae Catt. was intercepted from Senegal for the first time on January 8 in rice straw at New York. Sclerotium rolfsii Sacc. was intercepted on Sagittaria sagittifolia for the first time on January 11 at Buffalo on a shipment from China. Sclerotia tentatively determined as S. rolfsii, but not typical, were found on Eleocharis tuberosa corms from China at Buffalo on January 15. Undetermined, partially imbedded, black sclerotia about 0.2 mm in diameter were found on onion leaves from Holland at Philadelphia on January 21. Uromyces chloridis Doidge, first interception, was found on Chloris pycnothrix used as packing in baggage from South Africa on July 10, 1936, at New York.

Lespedeza rust intercepted.--The Japanese rust assigned to Uromyces lespedezae-procumbentis (Schw.) Curt. was intercepted on leaves among seeds of Lespedeza formosa in cargo from Japan on January 14 at Seattle. The American form of this rust does not attack oriental species of lespedeza. All stages of the American form occur on lespedeza. The aecial stage of the rust in Japan is unknown. Spore measurements of the two forms do not agree. It appears desirable, from a quarantine standpoint, to consider the oriental rust as a distinct species.

Edible smut in stores.--Ustilago esculenta P. Henn., an edible smut causing marked hypertrophy of Zizania (wild rice) plants was found in stores from Japan at New York December 7. The smutted material was supposed to be bamboo sprouts, determination of the smut being necessary before the identity of the host was learned. The smut spore pockets can be seen with the naked eye in the hypertrophied tissue when it is cut through, appearing as dirty specks.

DOMESTIC PLANT QUARANTINES

Transit inspector's services valuable in flood relief.--Transit inspectors, in carrying out their regular daily schedule, are required to have accurate information with reference not only to routing and distribution of shipments of parcel post, express, and freight in the vicinity of the terminal in which they are working, but also to details concerning the transfer of such shipments over the main connecting lines that operate through the stations to which they are assigned. At Cincinnati, Ohio, knowledge of such transfer outlets proved invaluable in the recent flood disaster. The local relief agencies, on learning that inspector E. J. McMerney was so trained, requested that he be assigned to assist in the routing of shipments of food products into Cincinnati, because of his familiarity with local terminal transfer tracks, freight depots, and other points connected with transportation. He was also given the responsibility of assisting the health authorities by determining the contents of some 900 cars caught in the yards, assembling for inspection the 135 cars containing perishables, and consigning contaminated products to the dumps for destruction to prevent spread of disease.

Transit inspection an informational service.--In the enforcement of the pink bollworm quarantine regulations as recently revised to include several additional counties in the regulated area, transit inspectors have been of service by intercepting shipments of second-cut linters that had been consigned contrary to the regulations. Uncertified shipments of this kind, if consigned to Southern States, might result in the establishment of the pink bollworm. The receipt of notices of the infringements enabled the project leader promptly to contact the shippers concerned, as well as the agents accepting the shipments for transportation, and explain the regulations, thereby preventing further uncertified materials from being consigned from these points.

Violations intercepted.--A recent survey of the records of transit inspectors shows that 1,205 shipments moving in violation of Federal quarantines, were intercepted during the period July to December 1936. This represents an

increase of 208 violations intercepted over the same period last year, owing no doubt to increased transit-inspection personnel at several of the terminals and to the movement of a greater volume of nursery stock and other material restricted by quarantine regulations. Shipments destined to Canada, the District of Columbia, and every State in the Union, except Nevada and Wyoming, were found moving in violation of one or more of the Federal domestic plant quarantines.

Phony peach disease control greatly advanced by eradication of worthless trees.--The removal of 52,000,000 worthless peach trees from 11 infected States in the past 18 months, accomplished by funds from the Emergency Relief Appropriation Act represents a marked advance in the campaign against the phony peach disease. The 121,597 properties worked in the eradication program since August 1935 represent over three times as many as were inspected in the entire 7-year program under regular appropriations. The progress of the eradication program is indicated by the fact that in 38 counties in which the disease previously existed, inspection in 1936 failed to disclose any infected trees. These counties are located in eight States.

Progress in citrus canker work.--Inspection for citrus canker is being continued in Texas and Louisiana, with the major activities, however, centered in Mississippi and Alabama for the purpose of inspecting every citrus tree, including extensive areas of Citrus trifoliata, throughout the Gulf coast region. In the 4-month period ended with the close of the year, one Mississippi county and parts of two others have been worked, with a total removal of 1,500,000 trees from 329 properties. In Alabama three-fourths of the citrus area in Mobile County has been inspected and 90 percent of the trees found have been eradicated by relief crews. In two counties 1,600,000 worthless citrus trees were removed from 403 properties.

Peach mosaic work in California.--The tree-removal work is being continued in California. In Riverside and San Bernardino Counties 9,700 infected peach trees and 34,000 abandoned peach trees were removed in the period from September 1 to January 31. A force of 84 persons was employed under the emergency project in January.

CONTROL INVESTIGATIONS

Nicotine bibliography ready for distribution.--A Bibliography of Nicotine; Part II. The Insecticidal Uses of Nicotine and Tobacco, by N. E. McIndoo, of the Division of Control Investigations, National Agricultural Research Center, Beltsville, Md., and R. C. Roark and Mrs. R. L. Busbey, of the Division of Insecticide Investigations, Washington, D. C., is now ready for distribution. This bibliography is issued in three sections as Circular E-392. It contains 628 pages, including 2,497 abstracts. Copies may be obtained from either of the above-named divisions.

Bacillus causing disease in southern armyworm isolated.--F. H. Babers, Beltsville, has isolated a bacillus from the blood of a diseased southern armyworm (Prodenia eridania Cram.) and has identified it as the cause of the disease. The cultural characteristics of the bacillus were also determined.

Nicotine fumigation compared with hydrocyanic acid gas.--H. H. Richardson, also of the Beltsville laboratory, reports that under closely controlled laboratory conditions nicotine fumigation was very effective against the bean aphid (*Aphis rumicis* L.) a concentration near 0.75 part of nicotine per million parts of air (.0052 mg per liter) being sufficient with a half-hour exposure at 77° F. to give nearly 100-percent kill. F. J. Brinley and R. H. Baker have reported studies of fumigation with hydrocyanic acid gas (Biological Bulletin 53 (3):201, 1927) using this same aphid under similar conditions. They found it necessary to use a concentration of 724 parts of hydrocyanic acid gas per million parts of air in order to obtain near 100-percent kill; that is, with hydrocyanic acid gas, a concentration nearly 900 times greater than the nicotine on a molecular basis was necessary in order to give equal killing power. In other words, 900 times more molecules (or 150 times more weight) of hydrocyanic acid gas than nicotine were necessary to give the same kill. On the assumption that the resistance of Brinley and Baker's aphid was somewhat similar to that of ours, nicotine appeared to be much more toxic to this aphid than was hydrocyanic acid gas.

INSECTICIDE INVESTIGATIONS

Micro-method for nicotine.--The necessity of accurately determining a quantity of nicotine of the order of 0.1 mg in connection with greenhouse-fumigation experiments prompted the development of a suitable method. J. R. Spies, formerly of the Division of Insecticide Investigations, has recently described a micro-method for the determination of nicotine, based on the precipitation of silicotungstate. Solutions containing 0.1 to 0.5 mg of nicotine can be analyzed by this method with an average accuracy of 0.002 mg. This method is now being used by Mrs. R. L. Busbey to determine the quantity of nicotine vapor in flasks in which insects have been fumigated by H. H. Richardson, of the Division of Control Investigations. Dr. Spies' method is published in Industrial and Engineering Chemistry, Analytical Edition (vol. 9, p. 46, Jan. 15, 1937).

Phenothiazine.--Data on the use of phenothiazine as an insecticide, compiled by L. E. Smith, has just been issued as Circular E-399. Phenothiazine has been tested against Mexican bean beetle, tobacco hornworm, lima bean pod borer, grape berry moth, various cotton insects, apple maggot, plum curculio, tomato fruit worm, cabbage worm, Japanese beetle, European corn borer, corn ear worm, tomato pin worm, fire brat, screwworms, and other insects. At present most interest in phenothiazine is based on the promising results obtained with it as a substitute for lead arsenate in control of the codling moth in the Pacific Northwest.

Organic sulphur insecticides.--W. A. Gersdorff, using the goldfish as the test animal, has recently reported (Jour. Agr. Research, vol. 53, no. 11, p. 841, Dec. 1, 1936) that phenyl mercaptan is seven times as toxic as phenol but only one-fiftieth as toxic as rotenone. For several years this Division has been investigating a number of organic sulphur compounds as insecticides, especially as substitutes for lead arsenate. These toxicity studies have demonstrated that many organic sulphur compounds are highly toxic and are well worth study for possible use as insecticides.

Chemical evaluation of derris and cube roots.--During the last few years a very extensive literature on methods for the chemical evaluation of derris and cube has grown up. H. A. Jones, of the Beltsville, Md., laboratory, of the Division of Insecticide Investigations, has been testing and comparing the various chemical methods that have been proposed for this purpose. In an article published in the Journal of Agricultural Research (vol. 53, no. 11, p. 831, Dec. 1, 1936) he describes tests to determine the value of optical rotatory methods for the evaluation of rotenone plants. In about half the samples examined results derived from the optical activity of acetone extracts were widely different from the toxicity values. Mr. Jones concludes that the use of optical rotatory power cannot be recommended as a means of evaluation of derris and cube roots.

BEE CULTURE

Beginning of egg laying of package-colony queens.--C. L. Farrar, of the Intermountain States Bee Culture Field Laboratory, Laramie, Wyo., reports significant observations on the time required for queens to begin laying in package colonies. Out of 549 packages installed by customary methods, permitting the bees to release the queen by eating out a candy plug (a hole having been made thru the candy with a match or wire), 7.3 percent of the queens began laying in 1 day, 16.8 percent in 2 days, 21.1 percent in 3 days, 17.9 percent in 4 days, 18.8 in 5 days, 8.2 percent in 6 days, 3.8 percent in 7 days, 4.9 percent in from 8 to 11 days, and 1.3 percent were not released, because of lack of bees. In contrast, 20 queens released with the bees after thorough feeding gave 100-percent safe introduction and all began laying within 12 to 20 hours after the packages were installed. Early and uniform initial egg laying for all queens in a group of package colonies should reduce drifting between units and, probably, supersedure. It will also facilitate the development of productive colony units because emerging young bees must replace the original package bees, which have a relatively short life.

Nosema apis and Malpighamoeba mellifica found in colonies at Laramie, Wyoming.--John D. Hitchcock, Laramie, reports that examination of the mid-intestines of individual bees during a 10-week period showed an unsuspected infection with Nosema apis of 4.4 percent in those bees falling to the bottom board of one colony and of 2.7 percent in another colony having normal death rates. These colonies also showed a slight infection with Malpighamoeba mellifica, though the individual bees were not infected with both parasites. Mass examinations of dead bees from in front of other colonies (not from the cluster) showed 11 of 45 also infected with Nosema, though they appeared normal when prepared for winter. This would suggest that the parasites may be harbored over winter awaiting more favorable conditions for spread in a locality where these diseases have not previously been noticed.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

New records of Noctuidae from Kansas.--Contained in two large sendings of moths received from R. T. Cotton, of the Bureau's laboratory at Manhattan, Kans., was some material which has supplied new records and valuable specimens for the collection in the National Museum. The sendings consisted of Noctuidae collected and reared principally by H. H. Walkden in connection with field studies on this group. Two apparently new species of Schinia were included and a new species of Lygranthoecia. There were also specimens of numerous forms previously not well represented at the National Museum, including three individuals of Phaioecia duplicatus Sm., of which only the unique type was in the national collection. In addition, the identification of this large volume of material by J. F. Gates Clarke has been responsible for initiating taxonomic studies in certain groups of Noctuidae, the classification of which is badly confused.

New distribution record for an aegeriid.--Two lepidopterous larvae were recently received from Tom O'Neil, of the Georgia State Entomologist's office, with the notation that they had been taken from large pine trees at Niles Gap, Union County, in the mountainous section of Georgia. They have been identified by Carl Heinrich as the aegeriid Parharmonia pini (Kellcott), a species hitherto known only from the Northeastern States and Canada.

An eastern economic species of Lepidoptera in Idaho.--In a small lot of moths received for identification from J. C. Evenden, of the Coeur d'Alene, Idaho, laboratory, were several specimens which have been identified by J. F. Gates Clarke as a variety of the geometrid Nepytia canosaria Walk. They were reported to be present in large numbers in the pine forests. This species has heretofore been known only from the Eastern States.

New host record for Lygocerus.--Among material reared by D. W. Clancy, of the University of California, from cocoons of Hemerobiidae and submitted for determination, was a series of 20 specimens which have been identified by C. F. W. Muesebeck as an undescribed species of Lygocerus. This genus of the Calliceratidae (Serphoidea) is normally parasitic in aphids. Apparently no species has previously been recorded as a parasite of Hemerobiidae. There can be no doubt of the host association in this case, because the parasites were reared from isolated cocoons.

A new aphid on heather from England.--Two specimens of aphids intercepted at New York (N. Y. No. 67167) on heather bloom from England represent, according to P. W. Mason, either two new species of Amphorophora or a single greatly variable new species. No species of this genus has been known from heather, although seven species have been found associated with other members of the same family of plants.

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April 1, 1937

PROCUREMENT OF SUPPLIES FOR THE FIELD SERVICE

The special attention of field representatives of the Bureau is invited to Administrative Memorandum EQ-144 on procurement of supplies for the field service. This subject is important to practically all field men, and a number of points regarding it are rather generally misunderstood. The memorandum referred to makes clear the reasons for certain procedure, which has not been fully understood, and should result in expediting business of this kind.

A. J. ACKERMAN

With the death of A. J. Ackerman on February 27, 1937, the Division of Fruit Insect Investigations lost one of its oldest field workers, from the standpoint of length of service. Mr. Ackerman was born at Worcester, Mass., on October 5, 1889. He graduated from the Massachusetts Agricultural College in 1912 and received his M. S. degree from the same institution in 1914. On July 1, 1914, he entered the Division of Deciduous Fruit Insects, and served at West Chester, Pa., from 1914 to 1916; at Benton Harbor, Mich., in 1917; at Bentonville, Ark., from 1918 to 1933; and at Vincennes, Ind., until his death. The work at Bentonville was interrupted in 1921, when Mr. Ackerman was assigned for a season to work on codling moth control and spray residue on pears in California. Mr. Ackerman is best known for his work with lubricating-oil emulsions for the control of the San Jose scale. This work was carried on in Arkansas for several years beginning late in 1921. He also made extensive biological studies of a number of species of leaf hoppers on apple and grape. During recent years he gave practically all his attention to codling moth control.

FRUIT INSECT INVESTIGATIONS

Dichlorethyl ether kills larvae of dried-fruit beetle in soil.--D. F. Barnes and C. K. Fisher, of the Fresno, Calif., laboratory obtained kills of larvae of Carpophilus hemipterus L. in excess of 90 percent by means of water solutions of dichlorethyl ether applied to soil at rates of 10 and 20 cc per square yard. No consistent differences in lethal effect occurred when these quantities were applied in 1 gallon and in 2 gallons of water per square yard. A dosage rate of 10 cc killed 93 percent of dried-fruit beetle larvae, whereas 20 cc per square yard killed 98.7 percent. The tests were made under small-scale experimental conditions, and require confirmation by field trials.

Improved raisin cleaner removes 90 percent of raisin moth infestation.--H. C. Donohoe, of the Fresno laboratory, reports that a portable shaker-screen driven by a 1/2-horsepower motor, at a speed of about 360 r.p.m. when loaded, was used to remove infestation of Ephestia figulilella Greg., from 253 tons of Thompson Seedless raisins during the harvest of 1936. The machine is an improved type, similar to that built in 1935. Samples from 8 lots showed that about 90 percent of the raisin moth infestation was removed. In addition to reducing infestation and feeding damage, the machine removed dirt. By proper use of the cleaner, supplemented by shade-cloth protection of cleaned fruit, delivery by growers of comparatively clean raisins is now in prospect for the first time.

Dichlorethyl ether effective against peach borer.--O. I. Snapp and J. R. Thomson, of the Fort Valley, Ga., laboratory, report excellent results from the use of dichlorethyl ether applied during the winter for the control of Conopia exitiosa Say in nursery stock before and after it is dug. The material was dissolved in water at the rate of 30 cc per gallon of water and then applied as a spray. Both the 1/4-pint and 1/2-pint dose per tree gave 100-percent control of the borer in nursery stock in the nursery row, with no tree injury. When applied to bundles of dug nursery stock heeled in an upright position, at the rate of 60 ounces for each bundle of 15 trees, the material gave 100-percent control of the borers, with no tree injury. Winter applications of dichlorethyl ether are now being made at Fort Valley to determine the effect of this water-soluble material on the peach borer in orchard trees of different ages.

Viability and infectiousness of Type A milky disease organisms found in meconium material.--In earlier experiments carried out by R. T. White, of the Moorestown, N. J., laboratory, it was found that Tiphia parasites of the Japanese beetle would oviposit and complete development on certain diseased host larvae. Further experiments have shown that a Tiphia larva which had successfully developed upon a diseased host was able to rid itself of all traces of the causal agent at the time its meconium was voided. It was found that the vegetative form of the organism was seemingly digested within the parasite's digestive tract. The question then arose as to the viability of the spores in the meconium, as well as the infectiousness of this material when it came into contact with healthy grubs. Experiments have been conducted to determine whether this meconium material could cause infection when injected directly into the blood stream of a healthy grub or whether it must be ingested by the grub and thus enter the alimentary tract. Summarizing the data from all these experiments, Mr. White states that no disease was produced when 50 grubs were inoculated by puncture with the disease material and allowed to cease bleeding before being stored in autoclaved soil. One grub out of 10 became diseased when allowed to bleed in the soil in which they were stored. Infection in this instance probably resulted from ingestion of the causal agent, rather than from the injection into the blood stream. On the other hand, 25 out of 56 grubs (44.6 percent) placed in soil contaminated with an aqueous solution of meconium material became diseased, indicating that the spores must enter the alimentary tract to cause infection. No disease was evident in any of the 65 grubs held as a check in autoclaved soil.

Effect of ferric oxide on acid lead arsenate as a stomach poison and repellent against Japanese beetle.--During the summer of 1936 several cases of arsenical injury were observed on the foliage of oak, linden, elm, and maple trees that had been sprayed with acid lead arsenate as a repellent against the Japanese beetle. As it had been reported that ferric oxide acted as a corrective for arsenical injury when used with acid lead arsenate, W. E. Fleming and F. E. Baker, of the Moorestown laboratory, make some tests with ferric oxide added to acid lead arsenate spray, in order to determine the effect of the ferric oxide on the toxicity and repellency of the acid lead arsenate to Japanese beetles. Smartweed was used as the test plant and was sprayed with 8 pounds of acid lead arsenate, alone and in combination with 8 and 16 pounds of ferric oxide per 100 gallons of water. The tests, using 200 beetles in each, were run under controlled conditions in the usual manner for making tests with the Japanese beetle. The results are given in the following table.

Ferric oxide used	: Average : beetles : poisoned	: : Relative : poisoning	: : Foliage : eaten	: : Relative : feeding
	: Number	: Percent	: Square inches	: Percent
None-----	80.7 ± 9.26	100 ± 16	2.3 ± 0.26	100 ± 16
Eight pounds-----	40.1 ± 5.53	50 ± 9	3.5 ± .45	152 ± 26
Sixteen pounds---	50.8 ± 4.93	63 ± 9	6.3 ± .77	274 ± 45

The data show a significant reduction in mortality and an increase in the amount of feeding which seems to approach significance, following the inclusion of ferric oxide with acid lead arsenate in the spray on smartweed. The results indicate that the use of ferric oxide with lead arsenate for the purpose of reducing arsenical injury to shade trees would be unsatisfactory because it reduces the insecticidal and repellent value of the lead arsenate.

Relationship of environment to colony survival of Japanese beetle parasite.--In connection with studies of the recovery of colonies of *Tiphia popilliavora* Roh. (Koiwai strain), M. H. Brunson, Moorestown, has studied the environment of the recovered colonies. As most of the colonies were placed in three soil series--Chester, sassafras, and Collington--only these series are considered. The relationship between colonies recovered and soil series is shown in the following table.

Soil series	: Colonies : liberated	: Colonies recovered	
	: Number	: Number	: Percent
Chester-----	44	37	84.1
Sassafras-----	55	36	65.5
Collington----	18	5	27.8

The relationship between type of colony location and percentage of colonies recovered is shown in the following table.

Location	Colonies		Colonies recovered	
	liberated			
	Number		Number	Percent
Golf courses-----	12	:	12	100.0
Fields (not cultivated)---	48	:	34	78.8
Lawns-----	13	:	8	61.5
Pastures-----	35	:	19	54.3
Orchards-----	13	:	5	38.5

The order of the above locations in percentage of recovery is, with one exception, the order of host-grub population per square foot in the different locations mentioned. The exception is that fields (not cultivated) would probably follow pastures in the average number of host grubs per square foot. The reason for fields appearing second in the table probably lies in the fact that wild carrot, the food plant of T. popilliavora, is more abundant in the uncultivated fields than in any of the other locations mentioned. The abundance of the food plant might prove to be a more important factor than it has been considered in the past. These data show definitely that the highest percentage of recoveries might be expected at colony points located in Chester soil series and the lowest percentage of recoveries at colony points located in Collington soil series. The data also indicate that orchards are poor locations for colonization and that golf courses, fields not cultivated, lawns, and pastures are preferable for colonization, in the order given.

MEXICAN FRUIT FLY CONTROL

Trapping in the lower Rio Grande Valley.--During the month of February traps set in the groves and brushlands of the lower Rio Grande Valley took 1,436 adult Anastrepha ludens Loew from 249 locations. The total number of flies trapped to date, namely 2,008, is far greater than during any previous year. Infested fruit was found on 13 premises in 5 districts during the last 10 days of the month. All of these infestations were extremely light and the properties were cleaned of fruit without difficulty. Approximately 4,250 cars of citrus fruits were moved by rail, truck, and steamer from this area during the month. The number of fruit flies of various species identified in February were as follows:

Species	Texas	Mexico
Adults trapped	Number	Number
<u>Anastrepha ludens</u> Loew-----	1,436	4
Premises-----	249	3
<u>A. serpentina</u> Wied.-----	7	0
Premises-----	7	0
<u>A. acidusa</u> Walk.-----	36	0
Premises-----	34	0
<u>A. sp. "X"</u> -----	8	0
Premises-----	7	0
<u>A. sp. "Y"</u> -----	121	1
Premises-----	93	1
<u>A. sp. "Z"</u> -----	1	0
Premises-----	1	0
<u>A. sp. Seg. 3</u> -----	4	0
Premises-----	4	0
<u>A. pallens</u> Coq.-----	494	1
Premises-----	136	0
<u>Toxotrypana curvicauda</u> Gerst.-----	42	0
Premises-----	39	0
Total-----	2,149	6
Larvae collected		
<u>A. ludens</u> -----	301	*306
Premises-----	13	
<u>A. serpentina</u> -----	0	*196
Premises-----	0	
<u>Rhagoletis</u> sp.-----	0	*3
Premises-----	0	
Total-----	301	505

*All from market fruit.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Alfalfa weevils survive long period in bales.--Ralph W. Bunn, of the Salt Lake City laboratory, reports that, in experiments to determine the occurrence of weevils in commercially baled hay, examinations have been made of a number of bales through the use of a shaker which reduces the quantity of hay to small volume and subsequent exposure of the residue to heat in large Berlese funnels. These results indicate that weevils occur in the Salt Lake Valley in hay baled from all four crops and that the number varies inversely with the length of time in the bale. Weevils have been found in bales with a maximum storage period of 189 days; however, of those having been baled 100 days or over, 52 percent have been entirely free from weevils, and three bales examined with storage periods of 202 to 203 days have all been entirely free from weevils. A study has also been conducted to determine the survival of weevils in bales maintained in the laboratory at an approximate temperature of 70° F., and "salted" with 2,000

weevils per bale at the time of baling in September. These bales were examined at intervals after baling. Living weevils were recovered in all bales examined up to and including 91 days after baling. The following tabulation gives the mortality of weevils in baled hay under the conditions indicated:

Storage period	:	Dead weevils
	:	Percent
1 day-----	:	11.82
10 days-----	:	35.18
31 days-----	:	74.47
61 days-----	:	99.27
91 days-----	:	99.55

It is noted that the vast majority of weevils are killed by 2 months' storage, but after that the few remaining weevils, which presumably are in especially favorable positions within the bale, die off very slowly.

Food consumption of grasshoppers and Mormon crickets.--J. R. Parker, of the Bozeman, Mont., laboratory, reports that in field experiments conducted in Montana during the summer of 1936 rangeland grasshoppers, mostly Aulocara ellioti Thomas and Ageneottix deorum Scudd., in a two-month period (June 15 to August 15), destroyed 67 percent of the vegetation on plots marked for observation. The average population on June 15 was 22.7 grasshoppers per square meter, and by August 15 they had destroyed 41.0 grams of the 66.7 grams of total growth, or an average of 1.8 grams (dry weight) per grasshopper. On vegetation similar to that on the plots a cow would require slightly over 2 acres of range to provide her with a bare living for the 2-month period and a population of 37 grasshoppers per square meter would destroy as much feed as would the cow. In laboratory studies it was found that 20 adult Mormon crickets, feeding for a period of 20 days at 25° C. (77° F.), consumed 100.9 milligrams of dry food matter per day. At this rate, 1 cricket per square meter would consume approximately 1 pound of vegetation (dry weight) per acre per day; and 16 crickets per square meter, over an acre of vegetation, would consume as much as the minimum requirements of a cow.

Cheaper grasshopper bait.--Mr. Parker also reports that in a field study of materials that might be substituted for bran in grasshopper baits a mixture of one part low-grade flour to nine parts sawdust gave excellent kills. The flour-sawdust-sodium arsenite mixture gave almost as good kills as the standard bait and cost only about half as much.

JAPANESE BEETLE CONTROL

Procedure for purchases of gasoline.---At each Dutch elm disease temporary garage under formal lease a pump unit and an underground tank have been installed, permitting purchase of gasoline under existing Procurement Division contracts at tank-wagon prices. Over 80 percent of our gasoline requirements are filled in this manner. This not only results in lower purchase prices but also eliminates a vast amount of routine clerical work formerly necessary when large quantities of purchase slips had to be matched against duplicates accompanying monthly gasoline vouchers, with consequent delays in payment. Facilities for chassis greasing and minor repair jobs have been provided at the leased garages. In isolated areas, where no garages are maintained, informal short-term competitive bids have been obtained to cover emergency roadside deliveries of gasoline to our drivers. Bills are rendered monthly by the filling-station operators, at prices substantially lower than the posted service-station prices.

Dutch elm disease work.---During the month sanitation crews removed 126,473 dead and devitalized elms, bringing the grand total of dead and dying trees removed since the sanitation campaign began to 1,966,602. Specimens collected from elms exhibiting streaking in the bark numbered 189. Reports for the laboratory included 27 positive cultures, boosting the total of known diseased cases throughout the United States to 21,893. Only 12 recently confirmed trees were standing at the end of the month. The grand total of elms removed in clear-cutting areas is 748,578. In areas to be made free of elms 106,516 trees were treated with copper sulphate bands, making a grand total of 508,518 trees thus medicated since this work was inaugurated in mid-October 1936. Limited scouting for dead and dying trees in New York resulted in the tagging of 49,581 elms for subsequent removal. Total Departmental employees, C. C. C., and State personnel engaged in this work numbered 5,083 at the end of the month.

Large cut in W. P. A. field workers.---Drastic reductions were made in the number of W. P. A. field workers on the Dutch elm disease payrolls, effective on February 10 and 11 and again at the end of the 16-day monthly work period on February 23 and 24. These reductions were made to bring the number of men in Connecticut, New Jersey, and New York down to the quotas that could be carried through until June 30 under an allotment of W. P. A. funds that did not become available until March 4. From a peak of 5,996 laborers of all classes employed in January, the force to be carried into March was cut to approximately 2,400. The quotas of field workers allotted to the respective States are: Connecticut, 290; New Jersey, 1,446; and New York, 606.

Beaver dams broken to enable clear cutting.---To speedily complete a clear-cutting project in a swamp area of Putnam County near Continental Village, N. Y., approximately 100 men were assigned to the area for a brief period to remove 500 trees from a series of confluent lakes formed by beaver dams. Fortified by agreements from the property owners and the State game warden, the beaver dams were broken and the water level lowered approximately $2\frac{1}{2}$ feet. The drained area was clear-cut of elms, since nearly 100

percent of the elm population was dead, the trees apparently having succumbed last summer. Practically all of the trees were heavily infested with Scolytus multistriatus Marsh.

Gypsy moth egg clusters on inspected shipments.--Twenty-one shipments, from which 151 gypsy moth egg clusters were removed, were offered for inspection and certification during the month. The heaviest infestation found in any one district consisted of 73 egg masses removed from 5 truckloads of lumber inspected at North Amherst, Mass., prior to transportation to Avon, Conn.

Increased activity in Pittsburgh district.--A marked improvement in sales and shipments was shown in February, as reflected in demands for inspection and certification in western Pennsylvania. Owing to floods in some localities early in the month, transportation companies refused to accept shipments of nursery stock presented for shipment to consignees in flooded areas or in districts where transportation would be through flooded areas to localities beyond. No classified establishments in the regulated area were directly affected by the record-breaking floods.

Japanese beetle emergence in greenhouses.--By the middle of the month beetles became more numerous in greenhouses in the Philadelphia district, particularly in ranges run with high temperatures. Several rose growers assigned employees to hand-pick the beetles daily before they had time to damage the blooms. On February 15 two agents from the White Horse, N. J., laboratory collected 175 adults for use in the experimental work with nematodes. By the end of the month 485 adult beetles had been collected from a few greenhouses, for the use of research workers in Washington, D. C.

Equipment-conditioning project at St. Louis completed.--An equipment-conditioning program, part of the W. P. A. Japanese beetle trapping and control project in St. Louis, Mo., was concluded on February 19. The work included reconditioning and painting of the trap assemblies and other equipment and refilling the bait bottles with the liquid geraniol-eugenol-phenyl alcohol bait combination.

Surveys started in West Virginia and Ohio.--Late in February two inspectors were assigned to visit all nurseries and greenhouses in the Ohio infested districts to be placed under regulation, effective March 1. The inspector stationed at Hagerstown, Md., also started a similar survey of commercial establishments in the West Virginia area that will be added to the regulated zone.

FOREST INSECT INVESTIGATIONS

Eastern spruce beetle.--H. J. MacAloney, of the New Haven, Conn., laboratory, reports as follows: "The eastern spruce bark beetle (Dendroctonus piceaperda Hopk.) is killing mature and overmature red spruce in the Adirondack Mountains, N. Y., having been reported from the vicinity of Morehouseville, in the southern part of this district, and on the slopes of

Mount Marcy. In company with L. D. Casey, part of the 3,000-acre infestation at Morehouseville was examined and found to be serious. The number of trees dead is relatively small, but many are so heavily attacked that they will die before summer. This infestation is of comparatively recent origin and is a potential menace to a large area farther north, having mature spruce at higher elevations. The New York Conservation Department has been advised to make a general reconnaissance of all mature stands in the Adirondacks and to ascertain the extent of the infestation."

Chemical treatments of elm stumps.--In connection with the Bureau's Dutch elm disease eradication project, large numbers of elm trees are cut down and destroyed. It is desirable to so treat the stumps that sprouting and insect attack will be prevented. The method first used for this purpose consisted of debarking the stump to 6 inches below ground level. This proved to be difficult, especially when the ground was frozen or when the stumps had deep indentations, and the Division of Forest Pathology, of the Bureau of Plant Industry, began experiments in which various chemicals were applied to the stumps. In November 1935 the Morristown, N. J., laboratory began to cooperate with the Division of Forest Pathology in these experiments. R. R. Whitten, of the Morristown laboratory, has reported regarding these experiments under date of February 16. The following statement is taken from his report: "In three plots established in New Jersey the elms were cut and the stumps treated in November 1935, February 1936, and June 1936, respectively. Each stump was measured and given a permanent number and a record was kept of the treatment given. In treating the stumps the bark was loosened for a distance of 3 inches from the top, and the dry chemical salt was poured into the space between the bark and the wood. The bark was then nailed back in place. The chemicals used were commercial grades of granular copper sulphate, granular copper sulphate plus granular calcium chloride, granular calcium chloride, zinc chloride, sodium arsenate, sodium arsenite, mercuric chloride, sodium fluoride, sodium cyanide, and sodium nitrate. Three dosages, based on stump diameter, were used with most of the chemicals. Untreated stumps were included in each plot. General observations were made during June 1936, in the plots treated in November 1935 and in February 1936. This was done without disturbing the bark, in order to allow the stumps to remain unmolested during an entire growing season. In December 1936 all stumps were debarked and notes made on the occurrence of live wood, sprouts, and insect attack." In summarizing the results of the experiments, Mr. Whitten concludes that there was no marked difference in the effectiveness of the chemicals when applied in the fall, the winter, or the spring season. There was no relation between the dosages used and the control obtained, indicating the advisability of developing a method to prevent the chemicals being washed away by heavy rains. Considering toxicity to stump, prevention of sprout growth, and prevention of insect attack, sodium arsenite and sodium arsenate were most effective, followed by copper sulphate plus calcium chloride and sodium fluoride.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Progress of the gypsy moth project.--At the end of February the number of W. P. A. workers employed on the various phases of gypsy moth work had decreased to approximately 2,200. Since July 1, 1936, these men have located and destroyed more than 1,440,000 egg clusters. They have scouted nearly 2,050,000 acres and over 8,660 miles of roadsides. Approximately 6,860 acres of woodland were thinned and more than 5,930,000 trees in open country were examined.

No infestation in the barrier zone in Vermont.--No infestation has yet been found within the barrier zone in the State of Vermont. Several infestations have been found in the Massachusetts portion of the zone but they have been small, usually only a single egg cluster; however, in the Connecticut part of the zone several sizeable infestations have been discovered, particularly in Canaan and Cornwall.

Scouts find second old egg cluster in Indian Township, Maine.--A second old egg cluster was discovered by the small force of W. P. A. workers engaged in special work in Indian Township, Washington County, in the vicinity of the new egg cluster located in January by a University of Maine student. The first old egg cluster was found in January approximately 550 feet south of the new egg cluster, and the second one was found about 1,200 feet southeast of the original egg cluster. The woodland growth in the immediate vicinity of the last egg cluster is particularly unfavorable for the development of the gypsy moth. Scouting has been completed at this location and no further evidence of the gypsy moth's presence was discovered.

New egg clusters found at infestation in Princeton, Maine.--Six egg clusters were located by W. P. A. workers during the second week in February in the region of the infestation discovered last summer in Princeton, Washington County. This makes a total of 31 new and 2 old egg clusters destroyed by scouting at this infestation.

Gypsy moth crew now working near Canadian border.--The small force of W. P. A. workers assigned to duty under the supervision of a regular employee of this activity has started intensive scouting work in Baileyville, Washington County, Maine, where an infestation was discovered last summer. Baileyville is located directly east of Princeton, and is separated from the Canadian Province of New Brunswick by the Saint Croix River. No evidence of gypsy moth infestation has been discovered to date.

Eradication work continued at two infestations in New York State.--Federal W. P. A. workers engaged in gypsy moth scouting and eradication work in Shawangunk, Ulster County, N. Y., continued intensive work in the region of the infestation discovered in that town. These men have creosoted 22,642 egg clusters, in addition to those destroyed by regular employees of the New York Conservation Department incidental to their regular work. C. C. C. Camp enrollees and State employees paid from regular funds have continued to do intensive work in the area surrounding the

infestation found in Putnam Valley, Putnam County, N. Y. They have destroyed 27,949 egg clusters by creosoting. Approximately 2,000 acres are known to be infested in this locality.

No infestations found in New Jersey.--W. P. A. gypsy moth work is being continued in New Jersey under the supervision of regular State employees who are thoroughly experienced in all phases of the work. The results have been negative to date.

Infestation apparently eliminated in Dyberry, Pa.--The W. P. A. workers engaged in intensive scouting work in the region of the infestation in Dyberry, Wayne County, failed to locate any additional egg clusters in February and the scouting work is now completed in this town. Apparently the infestation has been eradicated. A total of 325 new and 51 old egg clusters was located and destroyed. This indicates a yearly rate of increase of approximately six to one, although the growth is more than 80 percent unfavorable to gypsy moth development. The normal rate of increase in the eastern part of the generally infested area in New England, prior to large-scale liberations of parasites, was considered to be six new to one old egg cluster.

No new egg clusters found at infestation in Clinton, Pa.--No additional egg clusters were found in Clinton Township, Wayne County, Pa., in February. The infestation discovered last December has apparently been eliminated. A total of 99 new egg clusters was destroyed at this infestation in January in growth considered largely unfavorable for the development of the gypsy moth. Assembling cages were set out in Clinton in the summer of 1934 and records show that nine of them were placed within a 1-mile radius of the recently discovered infestation. Two of these cages were less than $\frac{1}{2}$ mile and one other was slightly more than $\frac{1}{2}$ mile from this colony, but no male moths were recovered. Work has been started in some of the townships adjacent to Clinton and Dyberry, particularly in Clifford in Susquehanna County and in Oregon, Lebanon, Mt. Pleasant, and Paupack, in Wayne County. No infestation has been found in these towns.

Human skeleton found by gypsy moth scouting crew.--A crew of W. P. A. workers, scouting for the gypsy moth under the supervision of a regular Federal employee, discovered a human skeleton in a lonely wooded gully near Rita, Wright Township, Pa.

Progress of C. C. C. gypsy moth work.--During the period from July 1, 1936, to February 28, 1937, the C. C. C. camp enrollees engaged in gypsy moth work in towns east of the barrier zone in Massachusetts, Connecticut, Vermont, and New Hampshire scouted nearly 727,000 acres, more than half of the acreage being in Vermont, and more than 1,900 miles of roadsides. They examined approximately 870,000 isolated trees and nearly 41,800 yards of stone walls. About 3,880 acres of woodland were cleaned and thinned, approximately half of it being in Massachusetts. That State contained more than 4,000,000 of the 4,400,000 egg clusters treated during the fiscal year.

Increase in gypsy moth C. C. C. crews.--A daily average of 1,526 C. C. C. camp enrollees were engaged in gypsy moth work east of the barrier zone during the last week in February, a substantial increase over the 1,171 men similarly employed the last week in January.

Cooperative work begun in type-mapped area.--Work is progressing in the woodland block in the northern part of Greenfield and the southern parts of Bernardston and Leyden, Mass., where type-mapping has been completed by the E. C. W. forester working in cooperation with this Bureau. This block is to be treated for silvicultural benefits, as well as for gypsy moth control. The area is being surveyed to ascertain the number of egg clusters per acre in the different sections, the egg clusters are being creosoted, and chopping will be started when the survey is completed. Thinning, creosoting, and burlapping were done in some parts of the area last year. The area chosen for type-mapping contains a great variety of forest growth typical to this part of New England.

Pure white pine stand being established in Gill, Mass.--C. C. C. enrollees from the Montague camp are working in a section of Gill, which is largely a white pine growth but containing pockets of gray birch and scattered large white oaks. Most of the oak trees are heavily infested with gypsy moth egg clusters. These oaks are being removed, together with the gray birches, and will leave a practically pure stand of white pine. This section should require no further gypsy moth treatment in future years, other than removing sprouts of favored food plants.

Proposed 5-year plan for gypsy moth C. C. C. camps.--A plan of work based on a 5-year period has been prepared and presented to the Forest Service in Washington at the request of the regional forester. The acreage of the counties or parts of counties involved in the program is approximately 3,500,000, and the plan contemplates covering this acreage from two to five times, depending on the requirements of the different sections. The proposed work will require approximately 2,666,000 man-days. All of the work will be done in the area east of the barrier zone. Twenty-one camps have been requested--7 in Vermont, 6 in Massachusetts, 5 in Connecticut, and 3 in New Hampshire. The suggestion has been made that 157-man camps be established rather than the 200-man camps previously proposed.

Progress of brown-tail moth work.--There were 1,345 W. P. A. workers employed on brown-tail moth projects in Maine, New Hampshire, Vermont, Massachusetts, and Connecticut the middle of February. From July 1, 1936, to February 13, 1937, these men have cut and destroyed more than 1,940,000 winter webs in Maine, New Hampshire, and Massachusetts. No webs have been discovered in Vermont or Connecticut. More than 29,300 miles of roadside were scouted and over 127,500 trees were cut. Approximately half of the trees cut were in New Hampshire. Nearly 14,000,000 trees were examined, distributed rather evenly through all of the States except Connecticut, where work was begun recently.

Scouting for winter webs of the brown-tail moth begun in Connecticut.--
Scouting for brown-tail moth winter webs was started in Connecticut the first week in February. It is planned to cover a comparatively small group of towns adjoining the Massachusetts and Rhode Island State lines, from the Connecticut River eastward.

Favorable scouting conditions permit unusually thorough work.--Heavier infestations than had been anticipated were found in some sections of the territory, originating from webs on low growth. The winter of 1935-36 was characterized by particularly heavy falls of snow, and the low growth in many sections was completely covered and could not be inspected by the scouts. In contrast, weather conditions during the present winter have been unusually favorable for this type of work. The slight snowfall and comparative lack of stormy weather has provided almost ideal scouting conditions; consequently much of the infested territory has been covered more thoroughly than is usually possible.

Work of ground crews supplemented by specially trained high climbers.--
Practically the entire time of most of the crews on this project is devoted to scouting for infestations, cutting and burning winter webs, and eliminating favored food plants, in order to decrease the opportunities for infestations to persist. Infested towns are not considered completed until all the winter webs located have been destroyed. The ground crews eliminate as many of the webs as they can reach and are followed by small crews of specially trained high climbers, who work independently, cutting the webs from the higher trees.

PLANT DISEASE CONTROL

Barberry eradication during the winter.--Survey work in Minnesota during the winter months has been restricted to hilly districts in the southeastern part of the State. Late in December work was suspended in Brown, Yellow Medicine, Faribault, and Nicollet Counties, where side roads became blocked with snow and conditions otherwise were unsuitable for field work. Men assigned to this project have lost little time on account of inclement weather. L. W. Melander, in charge of the barberry-eradication program in Minnesota, reports that during the calendar year 1936 an intensive survey was made of 5,368 square miles of area, and that 2,936 man-months of relief labor were used in the eradication of more than 10,600 bushes on 611 different properties. During the year bushes were removed from approximately 150 properties in the cities of Minneapolis and St. Paul. During the year 25 locations were found where rust was observed to have been spreading from barberry bushes to susceptible grains and grasses. For the purpose of obtaining information on the early history of barberries in Missouri, George M. Frandsen, State leader, recently mailed questionnaires to 150 property owners on whose premises barberry bushes had been destroyed. The object was to determine the approximate age of the bushes that had been planted and the source from which the original plants were obtained, as well as to

collect data on the number of years the bushes had been spreading seed. Some bushes were reported as having been planted as early as 1869 and in these communities considerable natural spread has occurred. Apparently few common barberry bushes have been planted during the last 20 years, and Mr. Frandsen states that very few nurseries in Missouri have been selling susceptible species of barberries since 1918, even though Missouri has not been included with the States protected by the Federal quarantine.

Blister rust control in the Northeast.--Final figures for blister rust control work in the Northeastern States for the calendar year 1936 show that 1,784,378 acres were cleared of 55,668,747 wild and 73,926 cultivated Ribes bushes by the use of 527,574 man-days of labor. The acreage protected represents a 58.6-percent increase over 1935. Over 66 percent of the total acreage was worked under the W. P. A. program and about 31 percent with E. C. W. labor. Nursery sanitation measures were applied around 32 pine-growing nurseries and 13,799 acres were cleared of 14,826 wild and 220 cultivated Ribes. During the period 1918 to 1936, inclusive, a total of 217,255,718 Ribes have been destroyed on 13,900,191 acres, of which 19.2 percent, or 2,678,986 acres, was reeradication work aimed at maintaining control of the disease on protected pine-production areas.

Blister rust control in the Southern Appalachians.--In February Ribes-eradication work was carried on in Georgia, North Carolina, Tennessee, and Virginia. The weather was so mild that it was possible to uproot the Ribes without encountering frozen ground. Under the W. P. A. program, 154,632 Ribes bushes were destroyed on 144,360 acres by an average of 196 men, who put in 21,444 man-hours of labor. All of the bushes in North Carolina and Georgia were cultivated, as were 1,792 of those in Virginia. In cooperation with the Soil Conservation Service, 56 cultivated Ribes were removed in Virginia. The Soil Conservation Service furnished the labor for this work. Pine surveys were carried on in all of the Southern Appalachian States. In western Maryland from December 1936 to February 1937, inclusive, a total of 2,781 diseased pines were salvaged by cutting out the infected parts, but 73 were so badly diseased that treatment was not practicable and they were removed.

COTTON INSECT INVESTIGATIONS

Field examinations for hibernating pink bollworms.--Examinations of the plants, surface trash, and soil samples to determine the population of pink bollworms in the fields of the Big Bend district were completed in January by H. S. Cavitt and O. T. Robertson, of the Presidio, Tex., laboratory. After the crop was harvested the plants and crop debris on the surface of the ground and the soil to a depth of from 3 to 5 inches were examined on 5 square yards in each of 25 fields representing different intensities of infestation, plant growth, and soil type. The number of larvae on the plants and in surface trash ranged from 3.6 to 114, with an average of 27 per square yard for all fields. The number of larvae in the soil ranged from 1.2 to 13.6, with an average of 4.33 per square yard.

Last year the averages for all fields were 43 larvae above ground and 12.5 larvae per square yard in the soil. During the five years 1932 to 1936, for which records are available in 9 identical fields, the populations were 9.0, 16.0, 15.0, and 37.0, and 26.0 larvae per square yard above ground and 1.01, 2.28, 1.37, 13.46, and 3.75 larvae per square yard, respectively, in the soil. The average percentage of the overwintering population found in the soil this year was 13.78, as compared to 22.53 in 1935. The numbers of overwintering larvae in the fields were markedly reduced this year, notwithstanding a heavier infestation in green bolls during the early growing season. This reduction is thought to be due to earlier maturity of the crop with fewer green bolls during October, earlier killing frost, and cleaner picking of the low-grade damaged cotton. Examinations were also made of the numbers of larvae on plants and in surface trash on 100 square yards in each of two heavily infested fields before and after the fields were cleaned. Before cleaning an average of 36.2 larvae, and after cleaning 2.6 larvae per square yard were found, or a reduction of 71 percent of the larvae above ground was caused by cleaning. The numbers of larvae remaining after the clean-up were 2.4 and 10.2 per square yard, or 24,000 and 62,000 larvae per acre. The numbers left in the surface trash were approximately the same (2.51 and 2.63 per square yard) in the two fields, the difference being due to the larvae in the soil, which could not be reached by the clean-up.

Uncleaned fields increase pink bollworm infestation.--C. S. Rude reports an observation on the effect of leaving infested cotton bolls and plant debris in uncleaned fields on the pink bollworm infestation the following season. Infestation records were made in 14 fields near San Pedro, Coahuila, Mexico, on May 29, 1936, and in 12 of the fields examined the infestation was below 10 percent but very much higher in the other two. "In searching for an explanation of the heavy infestation in the two fields," Mr. Rude says, "it was found that there was a 900-acre field between them which had been in cotton in 1935. The stalks had been cut in this field in November and nothing more had been done. An examination in May showed an average of over 100 locks of cotton per square yard on the soil surface. On June 10 another series of counts was made. At a point bordering the neglected field the infestation was 76 percent. At a point about 75 rows farther into the field and away from the neglected field the infestation was 58.1 percent. At a point 150 rows into the field and away from the neglected field the infestation was 35.7 percent. At a point 1 mile distant from the neglected field and in the same direction as the other points mentioned, with continuous cotton, the infestation was 7.5 percent. These counts indicate that the neglected field served as the principal carry-over for the pink bollworm in the region and that the infestation gradually spread from this field throughout the surrounding cotton fields. For a distance of at least $\frac{1}{2}$ mile on all sides of the neglected field the cotton crop was so badly damaged by the pink bollworm that no cotton was picked from the fields."

Cotton flea hoppers emerge early.--K. P. Ewing and R. L. McGarr report the earliest emergence of cotton flea hoppers this year in the hibernation cages at Port Lavaca, Tex., that they have ever recorded. Three nymphs were taken on February 8 and 143 nymphs emerged during the month. No emergence occurred in comparable cages in February of last year and the previous record of early emergence was on February 12, 1934.

Varietal resistance of cotton to boll weevil.--The percentages of boll weevil-infested squares on 40 or more commercial varieties of cotton grown in adjacent rows were recorded during 1934 to 1936, inclusive, by E. W. Dunnam, Stoneville, Miss., to determine whether there was any varietal resistance. The weevil infestations were very light in 1934 and 1935 and no infestation was found in 1936. The infestation records were made around July 20, July 31, and August 10. By the last-named date some varieties were practically through fruiting and had an average of less than one square per plant. It was expected that the square infestation would be higher in the varieties with fewer squares. This was not the case, however, as the weevils moved freely between the different varieties in adjacent rows and there appeared to be no correlation between the diminishing number of squares and square infestation or between square infestation and boll damage in individual varieties. In 1935 dated tags were placed daily on 25 blooms of each variety, beginning on July 9 and continuing as long as sufficient blooms were available, usually about August 20 to 25. The open bolls were assorted according to the date of blooming and were examined for weevil damage, to determine the relation of boll damage to date of blooming. There was very little damage to bolls of any of the varieties until after the squares (their preferred food) became scarce and the weevils had to depend on bolls for feeding and breeding. In all varieties the bolls produced from blooms opening in July averaged less than 3 percent of damaged locks of cotton, whereas 20 percent of the locks produced after August 1 by the early fruiting, thin-hulled varieties, and 16 percent of those of the late-fruiting, thick-hulled varieties were damaged or destroyed. Although the bolls of the thin-hulled varieties were more severely damaged by weevils, they set a larger number of bolls and produced about 13 percent more undamaged locks than the late-fruiting, thick-hulled varieties.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Wild-cotton eradication.--The eradication of wild cotton in southern Florida made satisfactory progress in February. At the beginning of the month several counties on the west coast had been recleaned, but a second recleaning was begun to prevent any plants from maturing fruit. The plan is to reclean these counties now and at the same time thoroughly scout the areas to be sure that all wild cotton has been located. After this has been done, it will be necessary to revisit only the known locations of cotton. To give some idea of the progress being made, only 271 seedling plants were found during February in the counties of Hillsborough, Manatee, and Pinellas. With the exception of a small colony in Pasco County, the above three counties are the northernmost ones in which wild cotton has been found along the west coast. Crews have also been operating in the other

west-coast counties, and a good many plants have been removed. Several crews are working on the mainland keys and are making good progress. A considerable number of seedling plants have been removed, but only six mature plants were found in February. These mature plants were all in the vicinity of a colony cleaned for the first time last season. On Cape Sable the work is not progressing as fast as during previous clean-ups, but even so it does not appear that very many bolls have matured. In all of the areas any mature bolls are carefully gathered before the plant is removed so as to avoid any chance of scattering seed, thus producing additional plants later on. In February several new colonies were located and cleaned. These covered only $6\frac{1}{2}$ acres and contained 340 mature plants and 975 seedlings. The recleaning covered approximately 5,100 acres from which 43 mature, 201,412 seedling, and 814 sprout plants were removed. In addition, some 8,000 acres were scouted without finding any wild cotton.

Thurberia-plant eradication.--In the eradication of Thurberia plants in the Santa Catalina Mountains of southern Arizona better progress was made in February than in January. A total of 2,280 acres was covered, from which 56,043 Thurberia plants were removed. All of the work was performed using the camp in Sabino Canyon as a base. In March it will probably be necessary to move the camp to a new site, as most of the territory readily accessible from the present site has been gone over.

Laboratory inspection.--The inspection of green-boll samples at the San Antonio laboratory has gone forward satisfactorily. Some material has also been inspected at some of the field stations. The results in February were negative.

Road-station inspection.--In February only one interception was made at the Marfa, Tex., road station. This interception consisted of two pick sacks, in which four locks of seed cotton were found. An inspection of the seed cotton resulted in the finding of two living pink bollworm larvae. Toward the end of the month the record of cars indicated that very little dangerous traffic was moving, consequently the station was discontinued on February 28. During the time the station was operated over 6,000 cars were inspected and 47 interceptions were made. Of this number, 24 were infested with the pink bollworm, 123 living and 24 dead specimens being found. Cars from which 7 of the interceptions were made, containing 26 living and 12 dead specimens, were moving to other cotton-growing areas.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Efficiency of rotenone compounds against larvae of vegetable weevil.--In field experiments directed against the turnip aphid (Rhopalosiphum pseudobrassicae Davis) on turnips and mustard, by P. K. Harrison, at the Baton Rouge, La., laboratory, it was incidentally shown that dust mixtures containing 1.0 percent rotenone, with equal parts of finely ground dusting sulphur and tobacco as the diluent, and derris sprays containing approximately

0.02 percent rotenone, with or without a diphenyl butyl sodium sulphonate (1-1,000) as a spreader and wetting agent, were effective in protecting the turnips and mustard from damage by larvae of Listroderes obliquus Klug. The check plots and also the plots that received applications of sprays or dust mixtures containing nicotine sulphate were badly injured by the weevil larvae. The insecticide applications were begun when the plants and the infesting weevil larvae were small. They were repeated at intervals of 14 days, from four to six treatments being applied. In laboratory experiments performed by K. L. Cockerham and O. F. Deen, at the Biloxi, Miss., laboratory, it was found that sprays containing approximately 0.025 percent rotenone, with or without a diphenyl butyl sodium sulphonate (1-600) as a spreader and wetting agent, were not effective against either quarter-grown or larger L. obliquus larvae. Judging from these preliminary experiments, rotenone compounds may be effective against L. obliquus when applied to plants infested with small larvae.

Beet leafhopper conditions in southern Idaho presage low spring population.--J. R. Douglass and associates, of the Twin Falls, Idaho, laboratory, report that, on the basis of conditions existing in February in Twin Falls, Jerome, Minidoka, and Cassia Counties, southern Idaho, it appears that the season has been unfavorable for survival of Eutettix tenellus Bak., and a low spring population is indicated. Fall populations of E. tenellus in 1936 showed a decrease over those of 1935, even though there was considerable increase in the acreage of Russian-thistle, its principal summer host plant. Fall temperatures above normal, accompanied by deficient precipitation, prevented the germination of mustard, ordinarily the natural fall and winter host plant of E. tenellus. This forced the leafhopper to remain on undesirable host plants and enter the winter under very unfavorable conditions. Subzero temperatures were recorded throughout southern Idaho 11 times in January and were evidently unfavorable to E. tenellus, especially at the time when very little snow cover was present; however, the full effect of the subzero weather in January and February was reduced by snow coverage. Excessive soil moisture in February, due to precipitation and to melting of snow, has been detrimental to leafhopper survival. The percentage of leafhoppers recovered from hibernation cages containing favorable host plants was one of the lowest on record, female leafhopper survival averaging approximately 15.7, 17.4, and 26.9 percent, respectively, for Berger, Twin Falls, and King Hill. The percentage of winter survival increased with the decrease in elevation. Even in years of generally low survival, moderate populations of leafhoppers may be expected in beet-growing areas located close to leafhopper breeding grounds. Since spring conditions have a profound effect on leafhopper populations, as well as on the time of their migration into beet fields, further studies will be necessary to determine definitely the probable status of the leafhopper in southern Idaho this year.

Survival of sugar beet wireworm roughly proportionate to saturation deficiency of air.--In a series of laboratory tests with larvae of the sugar beet wireworm (Limonius californicus Mann.), designed to determine

the combined effects of temperature at different humidities on the survival of wireworm larvae, E. W. Jones, of the Walla Walla, Wash., laboratory, reports that the survival appeared to be roughly proportionate to the saturation deficiency of the air at temperatures of 68° and 77° F., respectively, and throughout a range of relative humidities extending from 90 to 100 percent. This comparatively simple relation to saturation deficiency did not persist at 86°, however, because at that temperature the duration of life of the wireworms was much shorter than at the same saturation deficiency and a lower temperature. In connection with these experiments it should be emphasized that the larvae of L. californicus are very sensitive to desiccation and usually die in a few days when exposed to ordinary atmospheric humidity. Their survival for extended periods can be obtained only when they are placed in the soil, in saturated air where droplets of water condensation are present, or in water. These experiments were performed, therefore, only at relative humidities of 90, 96, 98, 99, and 100 percent.

Methyl bromide as a fumigant against cigarette beetle.--W. D. Reed, of the Richmond, Va., laboratory, reports that recent results obtained in vacuum-fumigation tests with a commercially prepared methyl bromide-carbon dioxide mixture against Lasioderma serricorne Fab. indicated that this mixture is a promising fumigant. Eight tests were performed in February in the fumigation of Puerto Rican cigar-filler tobaccos in vacuum, in cooperation with one of the tobacco companies. Four of these tests were carried out with a mixture of 3-1/2 pounds of the methyl bromide to 46-1/2 pounds of carbon dioxide, and in the remaining four tests 5 pounds of methyl bromide to 45 pounds of carbon dioxide were used. The period of exposure was 4 hours in all of the tests and the dosage was 41.9 pounds of the fumigant per 1,000 cubic feet of space, or 5.8 pounds of the fumigant per ton of tobacco. The results of the tests are as follows:

Mixture	Insects		
	Treated	Alive	Mortality
	Number	Number	Percent
Methyl bromide, 5 pounds-45 pounds	:	:	:
carbon dioxide-----	1,500	10	99.3
Methyl bromide, 3 1/2 pounds-46 1/2 pounds	:	:	:
carbon dioxide-----	1,500	76	95.0
Checks-----	625	603	3.5

The temperature of the tobaccos at the beginning of the tests ranged from 55° to 58° F. In the presence of these relatively low temperatures the percentages of mortality obtained are very satisfactory.

Mexican bean beetle shows no preference in selecting hibernation materials.--R. L. Wallis, of the Grand Junction, Colo., laboratory, reports that in a series of cage tests to determine preferred hibernation materials for Epilachna varivestis Muls., in which six different materials were made available to hibernating beetles, no significant preference was shown for

pinon needles, vine needles, oak leaves, bean hulls, poplar leaves, or wild grass. Fewer beetles entered the pinon needles than any of the other materials, probably because these needles pack closely and it was difficult for the beetles to get under them. Approximately 30 percent of the beetles did not enter any of the materials provided but attempted to hibernate in cracks and crevices in the cage.

Rotenone-containing dust mixtures and sprays give good control of Mexican bean beetle.--In summarizing the results of insecticide tests performed against the Mexican bean beetle in 1936 on Fordhook lima beans, L. W. Brannon, of the Norfolk, Va., laboratory, reports that the best control was obtained with dust mixtures of derris-sulphur and cube-sulphur, each containing 0.5 percent rotenone. Derris-wettable sulphur and cube-wettable sulphur sprays (each containing 0.01 percent rotenone) also gave good control of the insect. The percentage of control with the dust mixtures was slightly superior to that obtained with the sprays. Sprays containing 3 pounds of cryolite to 50 gallons of water gave poor control of the bean beetle, as did also a dust mixture containing 60 parts of cryolite and 40 parts of sulphur by weight. The cryolite spray, however, gave slightly better protection against the bean beetle than did the dust mixture.

INSECTS AFFECTING MAN AND ANIMALS

Flood control and mosquito problems.--At a joint hearing held by Army engineers and Forest Service officials at Salem, Oreg., on February 25, H. H. Stage presented a brief statement on the relation of flood control to mosquito problems in the Willamette River watershed.

Mosquito-control work resumed in Georgia.--J. B. Hull of the Savannah, Ga., laboratory, reports that pest-mosquito control, which was started under the C. W. A., has been resumed on a county-wide basis under the auspices of the W. P. A. on Tybee Island, Ga. The work consists of dike and ditch construction and the installation of automatic tide gates.

Screwworm activity.--A. L. Brody, of the screwworm-fly research project, reports that at the Valdosta, Ga., and Gainesville, Fla., laboratories there was limited activity and breeding of the primary screwworm fly (Cochliomyia americana C. and P.) under controlled outdoor conditions in February. D. C. Parman, of the Uvalde, Tex., laboratory, reports some activity of this species in the vicinity of Uvalde. Observations made by W. L. Barrett in the vicinity of Catarina, Laredo, Zapata, Rio Grande City, Encino, George West, De Hanis, Crystal City, and Alice, Tex., during the period from January 15 to February 15, indicate that C. americana was most abundant along the Rio Grande from Laredo to Rio Grande City.

Effect of cold and irradiation on the development of stable fly.--

C. W. Eagleson of the Dallas, Tex., laboratory, studying the biology of Stomoxys calcitrans L., reports the following results of preliminary experiments: Cultures of pupae were held in a cold room at 15° C. (59° F.) from December 17 to January 19. A moderately high mortality was noted, but about 1,000 adults emerged. Their vitality was less than that of insects caught in the field on February 4. The egg production was very low, and the fertility of the eggs was low. About 80 percent of the eggs failed to hatch. Pupae held at 4° C. (39.2° F.) for 4 weeks failed to emerge. Fifty pupae were removed weekly and allowed to emerge at 27° C. (80.6° F.). The results were: Refrigerated 1 week, 98 percent emergence; 2 weeks, 82 percent emergence; 3 weeks, 36 percent emergence; 4 weeks, no emergence. A lot of 100 flies was held at 4° C. (39.2° F.), but removed and offered food in a warm room (25° C.) (77° F.) each day. On the twelfth day 94 percent of the flies were dead. It was noted that withholding food and water from flies held in low humidity caused a high mortality (68 percent) in 24 hours, whereas among similar flies in moist air there were no deaths. Adults irradiated roughly 7 hours per day with a General Electric CX 250-watt infrared-ray bulb oviposited about 1 day sooner than did control flies held in dim light. After 4 days the lots had laid approximately equal numbers of eggs, of equal viability. Mortality in the two lots is equal. There appears to be no advantage in irradiating breeding stock.

FOREIGN PARASITE INTRODUCTION

Citrus blackfly parasite in the Bahamas.--In 1931 P. A. Berry colonized the Malayan parasite Eretmocerus serius Silv. at Nassau on the island of New Providence. This parasite has completely controlled the blackfly in Cuba and various other West Indian islands and in Panama. Interceptions of infested lime foliage at Miami in 1936 indicated that control in the Bahamas might not have been attained. In February of this year C. P. Clausen visited Nassau to determine the status of the fly and its parasite. The 10-acre grove in which the parasite was first colonized was found to be heavily infested and at no time since its first liberation had the parasite exerted any appreciable check on the pest. Adult parasites were abundant on the foliage. Nearby groves, which had been just as heavily infested in 1931, were commercially clean in a short time and have remained so. No infestations have developed on young plantings. Most dooryard trees were clean, although a number were found to be heavily infested. Grapefruit trees invariably carried the greatest infestation. This is the first instance since the introduction of Eretmocerus into subtropical and tropical America that full field control has not been attained.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Two larvae, 29 puparia, and 1 adult, all living, of the olive fruit fly (Dacus oleae Gmolin) arrived at New York on January 11 among fresh olives in baggage from France. This is the first time this fruit fly has been intercepted at an American port from France. Living adults of Bruchus dentipes (Baudi) were found

at Detroit, Mich., on January 13 in a shipment of fava beans (Vicia faba) from Syria. Living larvae of the bean pod borer (Maruca testulalis Geyer) were intercepted at San Francisco on December 18, 1936, in string beans in ship's stores from Java. Living specimens of the whitefly Dialeurodes chittendeni Laing were taken at Washington, D. C., on February 15, 1936, on rhododendron in express from the Netherlands. A living specimen of the cicadellid Stirellus mexicanus Osb. was found at Brownsville, Tex., on December 6, 1936, on lettuce in baggage from Mexico. Five living larvae of the turnip gall weevil (Ceutorhynchus pleurostigma Marsh.) were taken at New York on December 11, 1936, in turnip roots in ship's stores from Poland. A living specimen of the chermid Psyllia peregrina Forst. arrived at Boston on June 16, 1936, on a cut flower of hawthorn in the mail from England. Living larvae and pupae of the celery fly (Philophylla heraclei L.) were intercepted at Philadelphia on November 26, 1936, in celery leaves in ship's stores from England. This trypetid, which is not known to occur in the United States, was formerly known as Acidia heraclei L.

Important fruit-fly interception.--Eleven living larvae of Anastrepha grandis (Macq.) were taken at Houston, Tex., on January 4 in two pumpkins in ship's stores from Argentina. This trypetid was originally described by Macquart from New Grenada in 1846. Max Kisliuk, Jr., and C. E. Cooley reared this species from watermelon in Brazil in 1931 and received adult specimens bred from oranges from the same country. There are also records of its having been obtained from cucumber, squash, and other cucurbits. It is also known to occur in Paraguay and Peru. It pupates in the ground, the pupal stage lasting from 20 to 26 days.

Orange pest from Brazil.--A larva of Gymnandrosoma aurantianum da Costa Lima was intercepted at New Orleans on November 11, 1936, in an orange in ship's stores from Brazil. Messrs. Kisliuk and Cooley found this olethreutid in Valencia orange, sour orange, and tangerine in Brazil. Da Costa Lima records a larva of this species having been taken on guava.

Pink bollworm interception in Puerto Rico.--A living pupa of the pink bollworm (Pectinophora gossypiella Saund.) was intercepted at the post office at San Juan, P. R., on February 2, in a cotton seed from Santurce, P. R. Of the approximately 100 bolls in the package, H. G. Taylor examined 2 and found 1 showing evidence of infestation and the other with a pink bollworm pupa. The package was addressed to New York.

Another foreign disease found in the United States.--Phytophthora cryptogea Pethyb. and Laffer, which is listed in Stevenson's manual as causing a disease of tomato and Cineraria seedlings in Great Britain and was later found to attack several hosts in Australia, has been found to be responsible for the destruction of several outdoor plantings of marigold in New York, according to an article by R. P. Pirone in the Florists Exchange (88:52, February 6, 1937). Marigold plants attacked out of doors were a foot high and half grown or older, but in the greenhouse plants of

all ages seemed to be susceptible. Death follows infection so rapidly that it is doubtful whether the disease was introduced on plants, if all hosts succumb as quickly as marigold. Dr. Pirone states that the fungus was found capable of producing seed decay. It is therefore possible that it was introduced on flower seeds. As the fungus can live over in the soil, eradication would be expensive.

Names for nemas infesting yams.--The new species of Hoplolaimus intercepted in yams from Nigeria (see News Letter 2:21, June 1935) is described by G. Steiner (Proc. Helm. Soc. Wash. 4:35, figs. p. 34, January 1937). The name of the genus was changed by Filipjev in 1936, therefore the name of the new species is Rotylenchus blaberus Steiner. The name of the nema described from a Jamaican yam intercepted in 1931 (see News Letter No. 10, p. 5, Oct. 1931) is now Rotylenchus bradys (Steiner and Le Hew) Filipjev instead of H. bradys.

New nema in Saccharum flowers.--Diseased flowers of Saccharum spontaneum from Arlington Farm were found to contain numbers of nemas of the seed-infesting type. The species, evidently new, has been named Anguina spermophaga by Dr. Steiner (Proc. Helm. Soc. Wash. 4:36-38, January 1937). The infested plants were grown from seed collected in Turkestan and the seed may have carried the parasite.

DOMESTIC PLANT QUARANTINES

Peach-tree removal well advanced.--Of the 247 counties in which the removal of useless peach trees has been undertaken since July 1935, at the close of the calendar year 1936, 75 percent were completed. Seedlings are expected to appear from time to time, necessitating a check to protect accomplishments to date. This project, conducted for the control of the phony peach disease, represents activity in nearly one-fourth of the States of the Union, and has provided emergency-relief employment to the extent of 1,900 man-years.

Emergency relief crews assist flood relief.--Over 100 relief laborers working on the phony peach disease control project in the vicinity of the flood-stricken areas were assigned to flood-relief work in the recent disaster, 24 men working 7 days in Missouri and 81 men working 8 days in Illinois.

Citrus canker recurring in Galveston area.--The reinspection of every citrus tree in the known infected area in Texas in February disclosed citrus canker on nine properties in the counties of Galveston, Brazoria, and Harris. All of these infections occurred on properties where the disease had been reported in recent months, and the 100 infected trees consisted of young seedling growth on spots where the parent trees were recently eradicated. Such seedlings are being rapidly eradicated, and a careful record is made of every remaining citrus plant in these counties.

Peach mosaic control.--Removal of abandoned and infected peach trees in the infected area in California has continued as a winter project, 10,000 infected and 47,000 abandoned peach trees having been removed from San Bernardino and Riverside Counties up to the close of February. Survey work is under way in El Paso County, Tex., and in Dona Ana County, N. Mex., for the purpose of locating peach-growing properties and discussing the situation with owners prior to starting the eradication project in these areas.

No Federal quarantine on peach mosaic.--No restrictions will be placed at this time on the interstate movement of host plants of the peach mosaic disease, known to exist in parts of Arizona, California, Colorado, New Mexico, Texas, and Utah, according to an announcement by the Secretary on January 21. In making this decision, he states that consideration was given to the fact that cooperative Federal-State inspection and eradication are under way in all infected areas and it is believed that at present the prevention of spread of the disease can be handled satisfactorily through State regulatory action. Such quarantines have been placed by Arizona, California, Oregon, and Utah. The California quarantine provides for the entry of the host plants from the infected areas when certified that no disease has been found for a year within 5 miles of the nursery or the budding wood, as determined by competent inspection prior to June 30.

Transit inspection increased in New York.--The recent assignment of additional inspectors in New York City has made possible the checking of quarantined materials in coastwise shipping from the Northeastern States, and of additional freight terminals and parcel-post points. An uncertified shipment of slag from the gypsy moth area constituted a recent important interception. Interdealer shipments in the Japanese beetle area are also being checked for compliance with quarantine requirements.

Articles checked in transit.--Transit inspectors report that shipments found in transit at this time of year, which require checking as to quarantines, consist chiefly of such articles as bulbs, greenhouse plants, increased quantities of quarry products and other building material; greatly increased quantities of citrus fruits from Texas, and wholesale movement of nursery stock from south to north. Some of the infringements consisted of movement from regulated areas of two shipments of cotton bolls, one containing a boll weevil; used empty cable reels; wooden crates with bark; pussy willow and other cuttings; baskets of sheet moss; and consignments of potted plants from a greenhouse in the newly regulated Japanese beetle area in Ohio to dime stores at a dozen points in the Midwest. At Atlanta a number of violations of State quarantines relating to phony peach disease were noted and reported to State authorities.

Boston's new parcel-post building facilitates transit inspection.--The many postal activities formerly scattered widely throughout the Boston district are now centered at the new \$4,000,000 parcel-post building at the South Station, where transit inspection can be done at three different sorting points. Fifty thousand packages were handled by postal clerks on the opening day.

Japanese beetle area extended.--Federal Quarantine No. 48 and supplementary regulations were revised effective March 1, the principal change consisting in the addition to the regulated areas of the cities of Brewer, Maine; Burlington, Vt.; Buffalo and Lackawanna, N. Y.; Cleveland, Columbus, Toledo, and Canton, Ohio; Parkersburg, W. Va.; and other districts in Ohio and Maryland.

Blister rust quarantine regulations revised.--White pine blister rust control areas having recently been legally established in Maryland, Ohio, Pennsylvania, and Wisconsin, wherein the planting or possession of currant and gooseberry plants is forbidden under State authority, the Department revised the quarantine regulations relating to the disease to provide that, effective March 1, such plants may be shipped to these States only under a control-area permit obtained from the officer of the State of destination. There are now 13 States to which this provision applies. Some minor modifications relating to pine shipments were also made.

States enact satin moth quarantines.--Following the recent revocation of the Federal quarantine relating to the satin moth, the States of Oregon and California placed quarantines in February relating to the pest. While the two quarantines are somewhat lacking in uniformity, both prohibit the entry of host plants grown in the infested areas of New England and Washington, and place restrictions with reference to storage in such areas. California also prohibits entry of host plants grown in the infested part of Oregon. Oregon also restricts the intrastate movement of the host plants from the 10 infested counties in that State.

INSECTICIDE INVESTIGATIONS

New knowledge of calcium arsenate.--The investigation of calcium arsenate being conducted by this Division has been referred to before in the News Letter. An important step in this investigation has just been made. The New York Agricultural Experiment Station, working with the method of determining soluble arsenic devised by them, concluded that those brands which showed high solubility contain dicalcium arsenate. We have recently had four samples of commercial calcium arsenate examined by S. B. Hendricks, of the Bureau of Chemistry and Soils, by the methods of X-ray analysis in comparison with a sample of pure dicalcium arsenate, $\text{CaHAsO}_4 \cdot \text{H}_2\text{O}$, prepared by us. The spectrum characteristic of this compound was present in three of the samples, and the intensity was in every case in the same order as the soluble arsenic. The fourth sample represented a special attempt by the manufacturer to produce a product of very low solubility, and the dicalcium arsenate pattern was absent from the X-ray diffraction spectrum. This acid arsenate theoretically should not be present in a mixture such as commercial calcium arsenate which contains excess free lime, but it evidently is formed in the regions where the arsenic acid is temporarily in local excess during its addition to the lime, and does not have time to be destroyed by the excess lime in the period of mixing and standing adopted by the manufacturer.

Variability in lead residues on apples.--There has just appeared in the Journal of Economic Entomology (vol. 30, no. 1, pp. 174-179, February 1937) an account by M. H. Haller, C. G. Cassil, and Edwin Gould of a study of the variability in spray residue from tree to tree in a sprayed plot and from sample to sample within a tree, the chemical work on which was done in this Division. Eleven spray treatments were applied to Stayman Winesap apples. Each spray treatment was replicated three times on adjoining or closely adjacent trees. The fruit from each replication was kept separate and duplicate 30-apple samples were taken from each replication for the determination of lead residue at harvest. Additional analyses of duplicate 15-apple samples were made with certain of the lots after various washing treatments. Considerable variation was found to exist between determinations within spray treatments. Statistical examination of the data showed that variations between duplicate determinations within replicates, representing sampling and analytical errors, were relatively small and due in part to the size of the apple in the samples. Variations between replicates within spray treatments would represent differences due to the application of the sprays or to differences in the growth condition of the trees. The variation between replicates both at harvest and after washing was found to be quite large and not attributable to the size of the fruit. These variations introduce a serious error that should be taken into account in the comparison of spray treatments.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Valuable series of the chrysomelid genus *Lema* received.--The Division of Truck Crop and Garden Insect Investigations recently submitted for determination two series of Chrysomelidae belonging to the genus *Lema*, taken in Ohio by B. J. Landis. The material was accompanied by valuable contrasting ecological data based on observations by Mr. Landis. One series was taken on *Physalis* while the other was from jimsonweed (*Datura*). The species observed on the former plant was found not to feed on jimsonweed, while the other form was not common on *Physalis*. H. S. Barber has identified the series from *Physalis* as *Lema trilineata* Oliv. and the other as *L. ?lecontei* Clark, a name proposed to replace the preoccupied *trivirgata* Lec. Until the receipt of this material little value had been ascribed to the supposed distinctions between these and other forms of the *trilineata* complex. The data submitted with these specimens, however, suggest that two distinct species were involved. This type of information is always of definite assistance in clearing up taxonomic confusion and is greatly needed.

A European sawfly parasite established in the United States.--Among a quantity of parasitic Hymenoptera recently submitted for determination by A. E. Brower, of the Maine Entomological Laboratory at Bar Harbor, were three specimens which have been identified by C. E. W. Muesebeck as *Phanomeris phyllotomae* Mues. They had been obtained in July 1936 from larvae of the birch leaf-mining sawfly (*Phyllotoma nemorata* Fallen) at Bar Harbor, where a small colony of the parasite was liberated in 1933. This appears to be the first record of a recovery of this introduced braconid parasite.

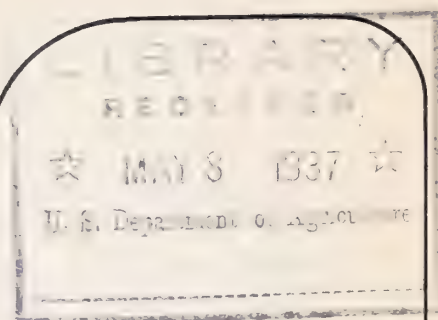
New distribution record for a spruce sawfly.--Specimens of sawflies, identified by Grace Sandhouse as Pachynematus alaskensis Rohwer, were contained among material recently submitted for determination by A. E. Brower. They had been reared from larvae taken on white spruce at Readfield, Harpswell, Mount Desert Island, and Mt. Katahdin, Maine. The species was originally described from Sitka, Alaska. Subsequently specimens were received at the National Museum from Itasca Park, Minn., but those from Maine are the first to be recorded from eastern United States. Although superficially resembling P. ocreatus (Harrington), females of alaskensis may be distinguished by the shape of the saw sheath, as well as by characters of the saw itself.

Another European sawfly in the United States.--Among material recently submitted for determination by the Division of Forest Insect Investigations were specimens that have been identified by Grace Sandhouse as Neodiprion sertifer (Geoff.). They were reared from larvae taken on Pinus mughus at Somerville, N. J., in 1925, by M. T. Smulyan who was at that time engaged in investigations of gypsy moth parasites in the New Jersey infestation. That the sawfly was locally abundant is indicated by the record that several thousand larvae were collected. Since N. sertifer has been reported as occurring on other species of pine in Europe, it will be interesting to learn whether any of the American species of Pinus are attacked.

Additions to Homoptera collections.--A male and a female of a species of Chermidae recently intercepted by the Division of Foreign Plant Quarantines at Brownsville, Tex. (Nos. 13642 and 13747), have been identified by P. W. Oman as Tetragonocephala flava Crawford, a species described from a single specimen collected at Brownsville in 1904 by H. S. Barber. Crawford reported that his unique type was a male, and drew a figure of what he considered to be male forceps. However, a study of the type and the two specimens mentioned above shows the type to be a female, the male never having been described. In addition to the type and the pair of specimens from Brownsville, T. flava is represented in the National Museum collection by a female specimen from Arizona, collected by Mr. Oman in 1933. A specimen of a leafhopper, determined as Cicadella albidonotata Fowler, intercepted at San Francisco, Calif. (No. 9980), on bananas from Panama, is the first example of that species to be acquired for the National Museum collection.

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UNITED STATES
DEPARTMENT OF AGRICULTURE



BUREAU OF
ENTOMOLOGY AND PLANT QUARANTINE
NEWS LETTER

VOLUME IV

OBITUARIES

Gersham Franklin White

Gersham Franklin White, senior pathologist of the Bureau of Entomology and Plant Quarantine, died suddenly of a heart attack at Moorestown, N. J., on April 27. Dr. White had been with the Department since 1906 and had been stationed in Washington most of the time. He was a world authority on diseases of insects and had published many articles on bacterial diseases of honeybees and other insects. A few years ago he perfected methods of rearing sterile maggots for surgical use. At the time of his death he was assigned to the Moorestown, N. J., laboratory to investigate the control of the Japanese beetle by means of diseases.

Dr. White was born at Hooksburg, Ohio, on December 22, 1873. He was graduated from Ohio University in 1901. He received his Ph.D. from Cornell University in 1905, and his M.D. from George Washington University in 1909. Dr. White was a World War Veteran, having served for 2 years as Captain in the Medical Corps. Funeral services will be held in the Fort Myer Chapel at 2:30 p.m. Friday, April 30. Interment will be in Arlington Cemetery.

Leslie A. Roberts

Leslie A. Roberts, inspector of the Division of Foreign Plant Quarantines, stationed at New Orleans, La., died on April 17, 1937, of acute bronchial pneumonia. After graduating from Texas A. & M. College in 1926, Mr. Roberts served for a number of years on the pink bollworm project in Texas and later entered foreign plant quarantine work, serving for various periods at El Paso, Tex., Columbus, N. Mex., Houston, Tex., and New Orleans, La. He is survived by a widow, Mrs. Margaret B. Roberts, and one son, Leslie Adrian.

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PRESENCE OF INSECTS AND CHEMICALS CAUSES FOOD ARRESTS

In a recent release from the Federal Food and Drug Administration are several notes involving insects. Among these were 915 cases of canned peas seized because of infestation with pea weevil, 1,700 pounds of almonds seized as worm-eaten, 2,514 cases of tomato paste, catsup, and soup, containing insect fragments, 25 bushels of apples bearing arsenate and lead residues, and 548 sacks of lima beans containing lead. Cases resulting in fines have been terminated involving insect-infested and wormy raspberries and canned spinach containing worms.

ROOF-GARDEN LABORATORY FOR STUDYING INSECTS AND SOILS

On the roof of one of the wings of the South Building of the Department in Washington, D. C., seven floors above the street, two glassed-in laboratories or penthouses for research by scientists have been completed recently. The first, which was completed last fall, is being used by plant specialists as an experimental greenhouse. The second will be used for studying insect pests and specially treated soils, work for which fresh air and sunshine are necessary. One compartment of the new penthouse is reserved for rearing unidentified insect pests. It has double doors, double screening, and extra strong glass so that no insect can escape. Bolts and locks keep out intruders. The characters by which many kinds of insects may be identified are known only for the adult stage. It is impossible to identify the immature stages. When living specimens of grubs or other immature stages belonging to groups that cannot be classified are submitted for identification, it is proposed to cage them so that they can complete their development, making adults available for study. After getting specific approval, entomologists and plant quarantine inspectors may forward insects in their immature stages in tightly sealed containers to Washington, where they will be reared under these strict quarantine conditions for identification. The association of the immature stages with the adults will give the entomologists knowledge that will aid in combating insect pests and in the enforcement of plant quarantines.

Next door to this quarantine room are two compartments used for the study of such insects as mosquitoes, ticks, and lice, which attack and annoy man and animals. These compartments also are secured against escape of insects and against intrusion. Most of these parasites require blood on which to feed and develop, and suitable animals--mice, guinea pigs, and

rabbits--are provided for this purpose. Two problems that will receive early attention are studies on the habits and development of wood ticks, because of their relation to Rocky Mountain spotted fever, and studies on species of mosquitoes suspected of carrying encephalomyelitis of horses. The investigations will not include studies on the disease organisms carried by these insects and every effort will be made to exclude insects infected with them.

FRUIT INSECT INVESTIGATIONS

Saw-toothed grain beetle in raisins on ranches.--According to data obtained by H. C. Donohoe, of the Fresno, Calif., laboratory, 6 lots of samples of Thompson Seedless raisins, of a total of 14 lots taken on ranches after harvest in 1936, contained adults of Oryzaephilus surinamensis L. Before screening with an improved motor-driven raisin cleaner, the 6 lots of fruit contained from 74 to 253 beetles per ton; after cleaning there were from none to 156 per ton. This is the first record obtained by Mr. Donohoe of the saw-toothed grain beetle in new-crop raisins on ranches. Since all of the raisins sampled had been stored in farmyards for various periods before they were cleaned, the place of origin of the infestation, whether in the vineyards or in the farmyards, was not determined.

Work on Japanese beetle in outer zone of spread.--James F. Cooper, formerly connected with the Division of Fruit Insect Investigations, but who has been engaged in work for the Florida State Plant Board at Key West for the past 2 years, has been reinstated in the Bureau, effective April 15, for work on the Japanese beetle in the outer zone of spread.

Effect of particle size of acid lead arsenate on its insecticidal action in soil.--W. E. Fleming, of the Japanese beetle laboratory at Moorestown, N. J., has completed tests to determine the effect of particle size of acid lead arsenate on its insecticidal action against Japanese beetle larvae in soil. Through the cooperation of the Division of Insecticide Investigations, a sample of ordinary commercial acid lead arsenate was reground, alone and with 2 percent of gum arabic, in a commercial mill, and the percentage of particles of different sizes in these samples determined by sedimentation analysis. The samples were shaken with dry sand and added to sassafras sandy loam at rates of 500, 1,000, 1,500, and 2,000 pounds per acre to determine the survival of larvae in the soil. The reground material was definitely finer (than the ordinary material) but no definite correlation was apparent between the insecticidal action and the fineness of the particles. The results showed definitely that the amount of acid lead arsenate applied is far more important than the size of the particles and that when the material is applied at the standard rate of 1,500 pounds per acre the ordinary form and the reground form are equal in insecticidal action.

Effect of acid lead arsenate on different plants when applied to soil about their roots.--W. E. Fleming has completed a summary of the effect of acid lead arsenate on different plants when applied to soil about their roots for destruction of larvae of the Japanese beetle. In this summary the reaction of 492 varieties of evergreen, deciduous, and perennial plants to the treatment is reported. In those treatments where acid lead arsenate is applied to reduce the larval population to prevent injury to the plants, observations have been made on 16 varieties of evergreen seedlings, 31 varieties of vegetables, 11 varieties of grasses, and 18 varieties of weeds. It has been noted that the reaction of most plants to acid lead arsenate in the soil appears to vary with the chemical and physical properties of the soil, with the age and vigor of the plants, and with the nature of the development of the roots. Plants tolerate large quantities of arsenic in soils that convert the material rapidly into an insoluble form. Seedlings appear to be more susceptible than mature plants and unhealthy plants are more easily injured than vigorous plants. Plants that develop strong tap roots or deep penetrating roots generally grow well in spite of acid lead arsenate in the upper layer of soil, but those which develop delicate primary roots confined largely to the treated layer are often retarded or even killed by arsenic in the soil.

MEXICAN FRUIT FLY CONTROL

The fruit fly situation in the lower Rio Grande Valley.--The harvesting season for the shipment of Texas citrus closed at midnight on March 31. Through that date 23,087 equivalent carloads had moved from the beginning of the season. There remain in packing sheds and cold storage approximately 350 more cars to be moved. Larval infestations developed at an alarming rate during the month and it was necessary to restrict the movement of fruit to certain designated northern markets whenever an infestation was found. In addition to this precaution, every effort was made to so thoroughly inspect the fruit that the chances of shipping infested fruit were reduced to a minimum. The fruit flies identified in March were as follows:

Species taken		Texas	Mexico
Adults		Number	Number
<u>Anastrepha ludens</u> Loew		296	2
Premises		131	2
<u>A. serpentina</u> Wied		1	0
Premises		1	0
<u>A. acidusa</u> Walk		3	0
Premises		3	0
<u>A. sp. "X"</u>		1	0
Premises		1	0
<u>A. sp. "Y"</u>		43	2
Premises		40	2
<u>A. pallens</u> Coq		235	1
Premises		70	1
<u>Anastrepha sp.</u>		1	0
Premises		1	0
<u>Toxotrypana curvicauda</u> Gerst		10	0
Premises		9	0
Miscellaneous		1	0
Premises		1	0
Total specimens		591	5
Larvae			
<u>A. ludens</u>		11,646	*928
Miscellaneous		20	0
Pupae			
<u>A. ludens</u>		28	0
Premises		17	0

*All from market fruit.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Wheat stem sawfly gradually replacing black grain stem sawfly in eastern Pennsylvania.--According to E. J. Udine, of the Carlisle, Pa., laboratory, as Cerhus pygmaeus L. has spread into eastern Pennsylvania it has gradually driven out Trachelus tabidus F., which has been established for many years in that part of the country.

No immunity to straw worm shown in common wheats in California.--W. B. Cartwright, Sacramento, Calif., reports that field tests at Birds Landing, Calif., of 300 wheat varieties to straw worm were completed in March and all varieties tested were found to be susceptible. The extremely early varieties Sunset and Ramona in previous tests had moderately low infestations but have this season been eliminated as possibly resistant varieties. Of special interest were three solid-straw strains found to be susceptible. Of the experimental wheats, Einkorn and Triticum timopheevi and the wheat-rye amphidiploid C. I. 11403 remain uninfested and continue to be of interest as possibly immune lines.

Hessian flies from California and Indiana vary in ability to infest wheats.--C. M. Packard, Lafayette, Ind., reports that results of greenhouse experiments show wide differences between the California and Indiana flies in their ability to infest Dawson, Illinois No. 1 W 38, Fultz, and Big Club wheats. These results support the theory that there are different races of flies in different regions, which must be considered in the breeding of fly-resistant wheats for those regions. Crosses of California and Indiana flies were fertile in some cases but not in others. In one test progeny matured successfully in Big Club wheat but not in Fultz. These experiments have been discontinued until next winter, as the stock of California flies has been destroyed to prevent any danger of infestation in the field with the advent of spring.

Temperature of flour is important factor in vacuum fumigation with hydrocyanic acid.--R. T. Cotton reports from Manhattan, Kans., that vacuum fumigation experiments with hydrocyanic acid indicate that the same difficulties are experienced with the use of this fumigant for the treatment of cold flour as with other fumigants. For a 1-hour exposure a dosage of 20.8 ounces of HCN per ton of flour had no effect on adults of the flour beetle buried in flour having a temperature of 51.8° F. By extending the period of exposure to 3 hours, however, this dosage gave a complete kill, indicating that diffusion of the gas through the flour eventually takes place. A 13-hour exposure with a dosage of 1.04 ounces per ton of flour did not give a complete kill of flour beetle adults in flour having a temperature of 53.6°.

Application of carbon disulphide-carbon tetrachloride mixture to surface of grain bin satisfactory under high temperatures.--Mr. Cotton reports from Manhattan that experiments to determine the feasibility of fumigating large elevator bins by applying carbon disulphide-carbon tetrachloride mixture to the surface of the grain has indicated that penetration to the bottom of the bins can be obtained when the mixture is applied entirely to the surface of the grain, provided the temperature of the grain is favorable. Apparently in grain that is cold the penetration of the fumigant is slowed up so that satisfactory results are not obtained. In one test in a bin 60 feet deep and having a capacity of 6,000 bushels, 6 gallons of the mixture applied to the surface of the grain, at a temperature of 92° F., gave an average kill of 86 percent of rice weevils in an exposure of 72 hours. This may be compared with the results obtained in a similar bin when 7 gallons was used with a temperature of 76°, where the average kill of rice weevils was only 58 percent. It would seem that recommendations as to the method of application of the grain fumigants of the nature of carbon disulphide-carbon tetrachloride mixture should be based on the temperature of the grain. With cold grain the fumigant should be applied directly to the grain stream as the bin is filled, whereas with warm grain it may be applied to the surface of the filled bins.

JAPANESE BEETLE CONTROL

Special elm sampling in 40- to 80-mile zone.--From about February 15 to March 15 eight special scout crews were assigned to the collection of specimens from trees in the area between the 40- and 80-mile radius lines from the center of the infected area. Devitalized or otherwise abnormal elms were sampled at approximate 5-mile intervals. If trunk or twig discoloration or bark beetle galleries were found, specimens were collected for culture tests to determine presence or absence of Ceratostomella ulmi. This resulted in the collection of specimens from 661 trees. Owing to scarcity of elms on Long Island and in southern New Jersey in the 40-80 mile zone, the survey was concentrated in a semicircle northwest of an arc through New Haven, Conn., and Camden, N. J. About 7,500 square miles were scouted in this manner. Specimens collected averaged one per 11 square miles. About 1,500 square miles of the surveyed area are within the present infected limits. Of the 661 specimens, 42 were taken in Connecticut, 148 in New Jersey, 313 in New York, and 158 in Pennsylvania. Thus far, laboratory culturing has resulted in the determination of Dutch elm disease fungus in only one tree, an elm located inside the New Jersey infected zone. Bark-beetle galleries were cultured by a special laboratory technique, but no disease fungus has been isolated. This type of scouting may be enlarged during the foliage season to supplement the systematic scouting and autogiro observations made in the 10-mile protective band surrounding infected territory. The greatest value of this type of work is the check that it gives on conditions in the zone from 60 to 80 miles from the infection center.

Elm-sanitation work progressing rapidly.--Initial work orders were issued late in March for removal of dead and dying trees in Bronx County, N. Y. Work of Federal sanitation crews in Rockland County neared completion, except in localities where the water was too deep for work. Instructions were issued for the starting of clear-cutting operations on the eastern slope of Bear Mountain. Sanitation work continued at a rapid rate in Putnam County. As the clean-up work in upper Westchester County neared completion, crews were shifted to lower Westchester County, where the work is scheduled for completion by early May. Sanitation work in New Jersey was complete, with the exception of a large number of dead and dying trees to be removed in connection with clear-cutting operations, plus the devitalized trees in areas assigned to the three New Jersey C. C. C. camps and in the Sussex County areas where completion of elm sanitation is impracticable.

Embargoed elms returned to infected zone.--Upon learning on March 30 that seven American elms of 6-inch caliper, 20 to 25 feet high, had been loaded at a Westchester County, N. Y., nursery and were en route to the Mount Vernon Memorial Highway, Alexandria, Va., immediate arrangements were made with the Washington inspection office to intercept these trees upon their arrival and order their return to the Dutch elm disease infected area. This timely interception prevented the movement of 20 trees that were involved in this order for elms to border the Memorial Highway. Upon return

to the infected area the nursery disposed of the elms to a private estate at a reduced price. A New York City landscape contracting firm was responsible for the movement of the elms contrary to the embargo on this species from infected sections.

Dutch elm disease accomplishments.--With a maximum personnel of 2,604 W. P. A. workers, 611 C. C. C. enrollees, 122 W. P. A. appointees, and 63 Federal and State appointees, sanitation crews were able to remove 72,771 dead and devitalized elms. Crews working in areas to be made elm-free accounted for an additional 80,187 elms of all sizes and conditions of vigor. Twenty-eight trees were confirmed as infected with the disease, bringing the total confirmations to March 31 to 21,932. Eradication of 38 confirmed trees left standing only 2 known infected elms. Elms treated with copper sulphate in connection with the tree-medication program to render areas elm-free numbered 36,910.

C. C. C. camp discontinued.--All arrangements were made late in March for the abandonment on April 1 of C. C. C. Camp P-104 located at West Haverstraw, Orange County, N. Y. This camp had been assigned exclusively to Dutch elm disease control in a tier of areas lying along the Rockland-Orange County line, comprising principally the Palisades Interstate Park, together with a second tier of mountainous areas along the New Jersey line in the southeast corner of Orange County. There still remain five C. C. C. camps engaged in Dutch elm disease work--three in New Jersey, and one each in Connecticut and New York.

Trunk sampling in Connecticut swamp area.--Connecticut crews were assigned to trunk sampling of all elms in the Tamarack Swamp near Greenwich, where the greatest concentration of Dutch elm disease infection in the State was found during the past summer. This work was practically completed at the end of the month. A number of infected trees were located through this work. This out-of-season scouting was designed to locate all infections present, so that the trees might be eradicated prior to emergence of the insect vectors of the disease.

State cooperation in Japanese beetle control.--Advices have been received from L. A. Moore, Superintendent, division of plant industry, Illinois department of agriculture, that an appropriation of \$4,200 has been made available for Japanese beetle trapping in that State for the fiscal year starting July 1, 1937. E. N. Cory, State entomologist of Maryland, has notified the Bureau that that State will have \$40,000 available for the fiscal year beginning October 1, 1937, and the same sum the following year, for control work on the Japanese beetle. An additional Maryland emergency appropriation of \$15,000 is also available this year for the extra inspection work entailed by the finding of beetles on some of the farms growing strawberry plants on the Eastern Shore and any possible emergency that may arise in connection with large-scale inspection of beans this summer. On March 22 E. H. Hanefeld, director of agriculture, Ohio department of agriculture, approved the first Japanese beetle quarantine to be issued by that State.

Getting the beetles through.--A severe snowstorm on March 15 for awhile threatened to interfere with the delivery to the Division of Insecticide Investigations of a quantity of adult Japanese beetles collected in rose-growing greenhouses in the Philadelphia district. An inspector from the Philadelphia office set out with 330 adults for the Conowingo Dam, near the Maryland State line, where he was to be met by an inspector from the Baltimore office, who in turn was to deliver the beetles to the experimental workers in Washington. Upon reaching Oxford, Pa., the driver found the roads drifted and traffic blocked by a bus stuck in a drift. By telephoning the State police station at Conowingo, the Maryland inspector was notified to drive up to the end of the stalled line of traffic. The exchange was made on foot and the beetles were safely delivered to the men who are making pre-season tests in an endeavor to work out a fumigant which may be substituted for the mechanical inspection of string beans.

Half of 1 percent for quarantine.--According to an item appearing in Horticultural Topics, a monthly bulletin of the New Jersey Association of Nurserymen, the total nursery area in the State amounts to 6,037 acres. The item further states that over \$5,220,000 is invested in land and buildings, and that an annual business of \$4,410,729 is transacted, with a profit of \$769,218. Approximately \$26,000 of Federal funds and \$30,000 of State funds is allotted to Japanese beetle quarantine enforcement in New Jersey. About 25 percent of the Federal allotment is devoted to farm-products inspection during the summer months. The actual Federal expenditure for nursery and greenhouse supervision and scouting of commercial establishments is therefore less than 0.5 percent of the nurserymen's gross sales and 2.6 percent of the net profits. Expenditure of these small percentages assures the nurserymen of access to markets in all parts of the United States.

Newly regulated area surveyed.--Contact visits were made to all commercial plant shippers in areas added to the Japanese beetle regulated zone with the revision of the quarantine effective March 1. In Ohio 14 establishments applied for classification, whereas 57 indicated their need for occasional inspection and 100 others were found to do only a local business. Of 70 establishments visited in the new West Virginia area, 26 have been assigned a preferred status of classification. Several establishments were added to the classification list in the few Maryland election districts added to the regulated area. Maps, regulations, or quarantine shipper's guides were left at all places contacted, and the establishments were thoroughly instructed in quarantine procedure. Shippers applying for classification were further instructed in the use of certificates and report forms.

Extra inspectors added.--To cope with increased demands for inspection of strawberry plants, the force of temporary inspectors working from the Salisbury, Md., office was increased to five. One inspector was added for full-time duty at a Willards, Md., establishment. An additional man was employed and stationed at a nursery at Towson, Md. Seven temporary inspectors were hired in New Jersey during the month, six on the State

payroll and one on the Federal per diem roll. On March 25 a temporary inspector was assigned to duty on Long Island to assist the regular inspectors stationed on the island. Work in the Pittsburgh district also required the employment of another temporary inspector.

Flower-show supervision.--Inspectors from the New York and Philadelphia field offices checked on the receipt and dispatch of stock at the International Flower Show at Grand Central Palace from March 15 to 20, and at the Philadelphia Flower Show held in the Commercial Museum from March 8 to 14. A violation of quarantine no. 63, involving the unauthorized movement of five white pine trees from New Jersey to New York City, was noted by the New York inspectors.

Heated soil brings out adult.--One adult Japanese beetle was collected in the yard of the Frankford Arsenal, Philadelphia, Pa., on April 1. The adult, together with a two-spotted lady beetle, was found crawling on the grass growing over an underground line of steam pipes.

Hundreds of egg clusters removed from inspected lumber.--Inspection of 12 truck loads of lumber at Amherst, Mass., resulted in the creosoting and removal of 304 gypsy moth egg clusters. The lumber was destined to Avon, Conn. Lesser infestations were found in 28 other shipments inspected. From these 76 egg masses were removed.

FOREST INSECT INVESTIGATIONS

Black Hills beetle becomes more cold-hardy under winter conditions.--Recent low-temperature tests with the Black Hills beetle (Dendroctonus ponderosae Hopk.) by N. D. Wygant, of the Fort Collins, Colo., field laboratory, reveal that the larvae under winter conditions may survive very low temperatures. The critical range of larvae from ponderosa pine during the latter part of October was from -2.5° to -10° F., whereas by the first of February mortality did not start until -20° , and at -35° , the lowest temperature reached, there was 34-percent survival. Experiments are now in progress to determine whether or not these surviving larvae are able to develop normally. The larvae from ponderosa pine during mid-March had a critical range similar to that during early February, but the larvae from limber and lodgepole pine had lost some of their cold-hardiness by mid-March and mortality started at a higher temperature. All material was stored in the same place and was therefore subjected to identical outdoor temperatures, previous to the tests. There were several days of warm weather early in March and it is possible that activity started in the thin-barked hosts, lodgepole and limber pine, which resulted in some of the larvae losing their hardiness and being killed at higher temperatures. The tests were made with naked larvae taken from infested logs stored in the woods and exposed in a low-temperature cabinet. Samples of 50 larvae each were exposed for 2 hours and 15 minutes at each 2.5° interval over the critical range.

Black Hills beetle epidemic on Enos Mills homestead.--Mr. Wygant also reports a concentrated attack of the Black Hills beetle in ponderosa pine on the original homestead property of the late Enos Mills, famous naturalist, in the vicinity of the Rocky Mountain National Park, Colo. The infestation on this property covers an area of approximately 15 acres and contains nearly 500 infested trees of all susceptible sizes, some with a stump diameter of 4 feet. The attacked trees occur in large groups, one group including over 100 trees. This epidemic adjoins the Rocky Mountain National Park and the Roosevelt National Forest, Colo., both of which contain additional infestations. Control operations, covering the entire unit, are being carried out by the Forest Service and Park Service.

Number of instars for larvae of *Dendroctonus monticolae* Hopk.--Studies made during the 1936 field season by G. R. Struble, of the Berkeley, Calif., laboratory, indicate that, during the course of development of *D. monticolae* larvae in sugar pine, there are four instars. Head-capsule measurements were made in February on 420 larvae. These were collected during July and August, 1936, at 2-day intervals throughout a period of 6 weeks. The measurements revealed four distinct groupings with 80, 76, 137, and 127 larvae in each group. To supplement these findings and to determine the period of each instar, six newly hatched larvae were planted in February to fresh ponderosa pine phloem inside glass tubes, and were held in rearing at room temperatures around 70° F. Fresh phloem was provided every other day, when examinations were made for shed skins. Four definite instars were found with periods of 5, 6, 4, and 16 days, respectively, for each.

Effects of low temperature on larvae of *Melanophila californica* Van Dyke.--A small series of tests of the effect of low temperatures on prepupal larvae of *M. californica* was made by A. S. West, Jr., of the Berkeley, Calif., laboratory, in January. The larvae used were contained in the bark of logs that had been stored outdoors at Berkeley since mid-October 1936, and were subjected to air temperatures below freezing (minimum of 28° F.) during January. Prepupal larvae in pill boxes were exposed for 2-hour periods to temperatures ranging from zero to -15° F. Mortality ranged from 6 percent at -5° to 25 percent at -15°. Increasing mortality was found at 2.5° intervals below -5°, with the exception of a mortality of 30 percent at -7.5°. Two lots of larvae in which no mortality occurred with exposure to a temperature of zero were subsequently exposed at -15° with resultant mortalities of 38 and 50 percent. In one test of larvae that had not yet reached the prepupal stage, 20 percent mortality occurred at zero, and 63 percent mortality when the same larvae were subsequently exposed at -15°. Surviving larvae used in these tests were set aside at room temperature and, beginning the middle of March, a number of these larvae have pupated. Pupae have developed in each lot of prepupal larvae, even though many of the individuals were frozen solid at temperature below -5°. Pupation also occurred in check lots at room temperature.

Winter survival of locust borer larvae in Ohio.--R. C. Hall, of the Columbus, Ohio laboratory, reports that sampling of the locust borer

population was made in March at Minerva, Hopedale, and Cambridge to determine winter survival with the following results: Minerva, 86.6 percent survival; Hopedale, 86.6 percent; and Cambridge, 86.5 percent. This represents a much higher survival for the mild winter of 1936-37 than for the extremely cold winter of 1935-36.

Insects concerned in decadence and death of chestnut oak.--H. J. MacAloney, of the New Haven, Conn., laboratory, reports as follows on an examination of dying chestnut oak on the Black Rock Forest, Cornwall-on-Hudson, N. Y., on March 27: "The general decadence and death of many trees of this species in this area is apparently due to a complex of factors, chiefly moisture deficiency and attacks by the golden oak scale (Asterolecanium variolosum Ratz.), the various cankerworms, and the two-lined chestnut borer (Agrilus bilineatus Web.). Precipitation records from the West Point Weather Station, about 4 miles distant, show an aggregate minus departure of approximately 48 inches since 1924. It is believed that this is the primary cause of this decadence. The Black Rock Forest is pursuing a policy of gradually eliminating the chestnut oak from the stands on the forest because of this decadence."

Laboratory studies on spruce sawfly.--Mr. MacAloney also reports on feeding experiments with the European spruce sawfly: "A laboratory experiment initiated in November 1936 and carried through the winter shows that the white, Colorado blue, and Koster spruces are more favorable for oviposition than Norway, black, and red spruces. The red spruce, as has previously been reported from Canada, is the least favorable of all, probably because of the more compact and close arrangement of the needles around the twig, making it difficult for the female to arch her back while preparing the egg-niche. There is evidence that the young larvae prefer Norway and white spruce needles and in some cases they actually migrated from the Colorado and Koster needles when one or both of the other species were present in the same cage. Mortality is heavy in the first two instars. Once these are passed, the larvae grow more vigorously on the needles of the white and blue spruces and develop to the cocoon stage more rapidly than on the other species tried. In a chamber where the temperature remained constant at 70° F. and where the humidity remained fairly constant from 50 to 65 percent, it was possible to cause complete development, from egg to adult, in about 6 weeks. A detailed report on this project is being prepared."

Mountain pine beetle infestation, Kaniksu National Forest.--During the last week of March T. T. Terrell, of the forest-insect laboratory, Coeur d'Alene, Idaho, made an examination of a mountain pine beetle infestation in the white pine stands of the Smith Creek drainage, Kaniksu National Forest. Mr. Terrell was accompanied on this examination, which required several days of difficult field work, by Corland James, of the Kaniksu forest office. Data obtained from this examination indicate an area of approximately 2,500 acres of mature white pine, with an infestation of 0.24 tree per acre, or a total of 614 infested trees. It is estimated that the attacks of these insects in 1936 destroyed more than 1 percent of

the total volume of the stand and, as the overwintering broods of beetles were in a healthy condition at the time of the examination, an increase in the severity of the infestation can be expected during the coming season. Infestations of this intensity are above normal and, if allowed to proceed unchecked, will develop into serious epidemics resulting in the destruction of a large percentage of the timber stand. Owing to conditions encountered during this survey, control measures have been recommended, to be instituted as early in the spring of 1937 as conditions will permit.

Status of mountain pine beetle infestation in lodgepole pine on sample strip of Targhee National Forest.--On a strip $4\frac{1}{2}$ miles long and 1 chain wide on the Targhee National Forest, Idaho, examinations made by A. L. Gibson, of the Coeur d'Alene, Idaho, laboratory, in 1935 and 1936 indicated the status of the mountain pine beetle infestation to be as follows:

		: Total :		Trees killed by--		: Trees green-sided from,	
Year :	trees :	Secondary :	Mountain :	or that have pitched-out			
	: attacked:	bark beetles :	pine beetle :	mountain pine beetle attack			
	: Number :	Number:	Percent:	Number:	Percent:	Number :	Percent
1935--:	479	: 5	: 1.0	: 240	: 50.1	: 234	: 48.9
1936--:	252	: 77	: 30.6	: 57	: 22.6	: 118	: 46.8

From the preceding data it may be seen that not only was the total number of attacked trees in 1936 only slightly over half the number attacked in 1935, but the mountain pine beetle killed only 57 trees in 1936, which is less than one-fourth as many as the 240 killed in 1935. The number of trees in 1936 that have overcome bark beetle attack on all but one side or have repelled their attack by a heavy flow of pitch total but one-half of those similarly affected the preceding year, although their proportion to the total kill remained about the same. In addition to the number of trees attacked being fewer in 1936, the average infested length was observed to have been shorter. Irrespective of this last difference, we find the number of trees attacked by the mountain pine beetle in 1936 to have been but 37 percent of the number hit the previous year. It is believed that the decrease noted on this strip is fairly representative of conditions over the entire forest.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Progress of gypsy moth project.--About 2,165 W. P. A. workers were employed on gypsy moth work at the end of March. Since July 1, 1936, the men have destroyed a total of more than 1,789,000 egg clusters. They have scouted nearly 2,284,000 acres and over 9,400 miles of roadsides. More than 6,600,000 trees in open country were examined.

Tree workers visit Greenfield office.--On March 26 the gypsy moth office in Greenfield, Mass., was visited by about 35 men, who had been attending a short course for tree workers at the Massachusetts State College.

Some of the men were town or city tree wardens and others were local gypsy moth superintendents. The different phases of gypsy moth work were explained, some of the problems were discussed, and they were given an opportunity to observe the methods employed in storing and handling various kinds of equipment at the shop and in the plants.

Equipment being made ready for spraying.--Preparations are being made for the opening of the spraying season, which normally begins between the middle of May and the first of June. Tests of new high-pressure spraying machines are being conducted; old equipment is being repaired and reconditioned, including several sprayers loaned by other projects; and supplies of spraying material, such as arsenate of lead and fish oil, are being accumulated at the storehouses.

Brush and debris burned.--Piles of brush and debris, accumulated during the fall and winter by thinning crews, are now being burned. The abnormally mild winter and light fall of snow has delayed burning operations until this month over much of the infested area, and the debris has absorbed so much moisture that burning is a slow process. It is the usual practice to burn at intervals during the year when weather conditions permit it to be done without danger to the surrounding vegetation. In order to avoid this dependency on the weather, portable machinery is being developed to convert the brush, branches, and debris into sawdust. This will enable the crews to dispose of the waste material immediately after it is cut.

Most egg clusters deposited in low situations.--Field reports from Massachusetts, Connecticut, and Pennsylvania indicate that, in many localities, 75 percent or more of the gypsy moth egg clusters deposited last summer are on rocks, ledges, brush, debris on the ground, and within 10 feet of the ground on tree trunks. Although this condition materially reduces the amount of climbing that must be done in order to creosote the egg clusters, it necessitates an extra careful examination of rocks, ledges, and debris, even in lightly infested territory, in order that no hidden clusters may be overlooked. Fortunately there has been little snow during the winter to interfere with the ground work.

State foresters in Pennsylvania to cooperate with Federal gypsy moth office.--According to a cooperative arrangement between the Bureau of Plant Industry and the Department of Forests and Waters of Pennsylvania, information concerning the gypsy moth has been sent to the inspectors and foresters of these departments throughout the State. They have been requested to send any specimens they may find, which they believe to be the gypsy moth, to the gypsy moth office at Wilkes-Barre.

Extreme care necessary in scouting property of powder works.--Unusual precautions are necessary in scouting the tree growth on the property of the Dupont Powder Works near Pittston, Pa. The area, comprising approximately 100 acres, is strongly fenced and closely guarded. Scattered over it are numerous magazines containing explosives and buildings for their

manufacture. Company regulations are necessarily extremely rigid. By agreement with the company the work in this area is being done by specially selected and thoroughly reliable regular Federal and State employees. Seventeen gypsy moth egg clusters had been located and destroyed up to March 31, and the work is not yet completed.

Gypsy moth scouts concentrated in marshy areas.--Swampy areas in the mountainous sections of Pennsylvania and in some sections of Vermont were frozen over sufficiently in March so that reasonably satisfactory scouting work could be done. Workers were taken from other locations and concentrated in the boggy areas in order to accomplish as much as possible while the ground remained firm.

Experienced W. P. A. workers given preference in Vermont.--In accordance with his practice of cooperating in every way with the Department of Agriculture, the director of W. P. A. employment in the State of Vermont has instructed local W. P. A. offices throughout the State to give preference, in filling requisitions from the Department, to men who have had experience in the type of work to be done. By this method the Department will receive full benefit of the previous experience and training of the workers and the expense of training new men will be materially reduced.

Eradication work continues at Shawangunk and Putnam Valley, N. Y.--Federal W. P. A. and New York State conservation department employees engaged in gypsy moth work in the region of Shawangunk, Ulster County, N. Y., had intensively scouted approximately 11,500 acres of woodland and open country and 47 miles of roadsides, and had located and destroyed a total of 22,725 egg clusters up to March 31. In the Putnam Valley district, combined W. P. A., C. C. C., and regular employees of the New York State conservation department have destroyed approximately 59,900 egg clusters to date.

Special survey completed in New York.--Special survey work, which has been carried on in territory west of the barrier zone in New York since the inception of Federal W. P. A. gypsy moth work in that State, has been completed. Since July 1, 1936, this work has been done in a total of 433 townships or boroughs, located in the 31 western counties of the State. No infestations were located as a result of this survey work.

Ice storm hampers future gypsy moth work.--Trees on high elevations in some sections of Connecticut and lower New York State were damaged considerably by a storm on March 15-17. Ice formed on the trees in sufficient quantities to break many branches and tree tops. Examination of these trees will be more difficult in the future, as the fractures will offer ideal locations for the deposition of gypsy moth egg clusters, and the clusters will not be easily discernible from the ground.

Progress of C. C. C. gypsy moth work.--Since July 1, 1936, C. C. C. enrollees have destroyed over 5,197,000 gypsy moth egg clusters. They have scouted more than 913,000 acres, including approximately 4,590 acres where

cleaning and thinning work was done. The tree growth along 2,486 miles of road and over 45,890 yards of stone walls were examined for egg clusters. This work has resulted in the apparent extermination of several small colonies, in greatly reducing the degree of infestation over many areas, and in rendering the growth at numerous sites much less susceptible to gypsy moth increase.

C. C. C. gypsy moth work hindered by reduction in trained personnel.--For the week ending March 27, an average of 1,446 C. C. C. men were employed on gypsy moth work east of the barrier zone, distributed as follows: Massachusetts 506, Connecticut 371, Vermont 452, and New Hampshire 117. This number will be materially reduced during April, as a large number of men left the camps at the end of the enrollment period and others are being transferred to camps in the West. It will be 4 or 5 weeks before the new enrollees will have reported to the various camps and received their training in gypsy moth work, and this will hamper the work in New England at a most important period of the year.

Changes in C. C. C. camps and regulations affecting gypsy moth work.--The C. C. C. camp at Unity, N. H., which was almost entirely a gypsy moth camp, was discontinued at the end of March. The camp at West Burke, Vt., is scheduled for abandonment at the end of April. A crew of 15 men from the Department of the Interior Veteran's Camp at Charlemont, Mass., will be assigned to gypsy moth work for the 6-month period beginning April 1. It is necessary to discontinue gypsy moth work in some sections as a result of a recent ruling to the effect that continued work cannot be carried on at distances from camp that cannot be reached in 45 minutes. Gypsy moth crews in the Connecticut camps have recently been equipped with fire-fighting apparatus, and the men have been instructed in its use. Training in fighting forest fires has also been given to the enrollees and foremen in some of the gypsy moth camps in Massachusetts.

Close supervision maintained over C. C. C. gypsy moth work.--During March all of the camps in Connecticut doing gypsy moth work under the supervision of the Bureau office were visited, as were several of the Massachusetts C. C. C. camps. Camp superintendents and gypsy moth foremen were interviewed, and visits were made to several areas where gypsy moth work had been done. Several locations were seen where the infestations would have caused severe defoliation next summer if they had not been cleaned up. In all cases where it is practical, emphasis has been placed on the removal of favored food plants so that these locations will be less favorable for the future increase of the gypsy moth. Clear cutting has been recommended at a few sites where gray birch or poplar are the only species present.

Progress of brown-tail moth work.--There were approximately 1,260 W. P. A. workers employed on brown-tail moth projects in the New England States at the end of March. Since July 1, 1936, these men have cut and destroyed more than 2,767,000 winter webs in Maine, New Hampshire, and Massachusetts. No infestations have been discovered in Vermont or Connecticut. Nearly 42,000 miles of roadsides were scouted and approximately 162,300

trees were cut. Over 20,704,000 trees were examined, principally in Maine, New Hampshire, Vermont, and Massachusetts.

Heavy brown-tail moth infestation found in Haverhill, Mass.--Scouting for brown-tail moth winter webs is progressing satisfactorily in the six New England States, although the discovery of unusually heavy infestations in some sections has necessitated more work than had been anticipated. One of these heavy infestations is located in Haverhill. The size of the area infested and the large number of trees, together with the density of the infestation, has made it advisable to employ six crews in cutting out the winter webs in that city. As many of the trees are tall, and the webs are beyond the reach of the ground crews, it is necessary to use additional crews of specially trained high-climbers. Large numbers of webs are being cut each week in Maine, New Hampshire, and Massachusetts but, if the weather remains normal, all of the territory should be completed before the end of the scouting season.

Infested towns on border of brown-tail moth quarantined area being rescouted.--In Massachusetts, all of the towns in Worcester County, both inside and outside of the quarantine line, have been scouted, as have all the towns in Norfolk and Bristol Counties, which adjoin the State of Rhode Island. Six towns in Worcester County, at the margin of the regulated area, were found to be infested by the brown-tail moth, as were four towns adjacent to the Rhode Island State line in Bristol County. The infested towns in these two counties, which are on the border of the quarantined area, are being rescouted in order to make doubly certain that all winter webs have been eliminated.

Light infestations found in Maine and Rhode Island.--Sixteen towns outside of the quarantined area in Maine were found to be lightly infested by the brown-tail moth. They were located principally in Hancock County. It is planned to continue scouting eastward until the limits of the infestation are determined. Infestations have been found in two Rhode Island towns that were infested last year, but the webs are considerably reduced in numbers. It is possible that these areas were reinfested from adjoining towns in Massachusetts.

No infestations found in Vermont or Connecticut.--Nearly all of the territory selected for brown-tail moth scouting in Vermont has been completed. No infestations were discovered. Scouting has been progressing in Connecticut since the first week in February but no infestations have yet been found.

PLANT DISEASE CONTROL

Many barberry bushes destroyed in northeastern Pennsylvania.--Approximately 2½ million barberry bushes have been destroyed in one infested area extending over 500 square miles in Lackawanna, Wyoming, and Susquehanna Counties, in northeastern Pennsylvania. Control work was first undertaken in this area in September 1935 and, according to L. K. Wright, in

charge of the program in Pennsylvania, barberry bushes had become so numerous in many parts of these counties that they not only constituted a rust hazard but were considered a serious pasture pest. According to local residents, the first barberry bushes were planted in Pennsylvania about 1750 and there were few farms within these counties that were not infested with bushes, many of which were growing wild along fence rows and in pastures where seed had been scattered by birds. During the past year many farmers volunteered their services and the use of teams and trucks for transporting chemicals in order to expedite the eradication work.

Rust surveys in Nebraska to locate barberry bushes.--Locating the remaining scattered barberry bushes in Nebraska is the most difficult part of the clean-up problem. One of the methods being tried is to make a detailed rust survey each year to determine areas in which grain rust is especially prevalent early in the season. These surveys involve (1) exposing spore traps to determine the prevalence of spores in the air; (2) field observations made by Bureau representatives; and (3) reports submitted by property owners who have been selected to furnish data relative to the development of rust in their communities. According to M. E. Yount, in charge of barberry eradication in Nebraska, an attempt is being made to have at least one farmer in each township in the State make regular reports during the growing season, relative to rust in his grain fields. The value of the rust survey as a means of locating barberry bushes varies tremendously from year to year. If weather conditions are such that barberries rust heavily and numerous local epidemics of the disease develop, observations made during a single season may prove extremely helpful in locating remaining sources of inoculum. Barberry bushes destroyed in Cedar County, Nebr., in 1932 may be cited as a good example. During the survey made that year severe stem rust infection was observed on rye in the north-central part of the county and a crew of laborers was assigned to make a complete inspection of all uncultivated lands within the area where the rust was most prevalent, with the result that barberry bushes were found and destroyed on 30 different properties. A careful survey of Boyd County in 1936 resulted in the eradication of barberry bushes on seven different properties within an area where rye had rusted severely during the years 1932, 1933, and 1935.

Physiologic races of rust present serve as guide to source of inoculum.--In recent years there have been numerous instances throughout the Mississippi River Valley where severe local epidemics of stem rust were found to be definitely correlated with barberry bushes. By identifying in the rust laboratory at St. Paul the physiologic races of rust present in localized areas, it is often possible to determine whether the outbreak is due to inoculum carried in by the wind or to infected barberry bushes in the immediate vicinity of grain fields. Rust epidemics caused by local barberry bushes usually appear earlier in the season and when specimens are identified in the greenhouse they are apt to show several physiologic races. Infection occurring as a result of wind-blown inoculum appears later in the season and is usually characterized by a wide scattering of initial inoculum centers. When specimens of rust

collected from these centers are identified in the laboratory the physiologic races known to have survived the winter in the South are the ones most generally present.

Changes on white pine plot 1 year following Ribes eradication.--

The New Hope white pine area near Stevens Point, Wis., is an upland white pine hardwood type, with pine trees averaging about 2,000 per acre and varying in size from seedlings to poles, with a few scattered seed trees and some oak trees forming a broken overstory. The Ribes were all prickly gooseberry (R. cynosbati) and averaged about 200 per acre. They were eradicated in October 1935. At that time many young cankers were present on the pine and a study plot was established on the area to measure the effect of control work by obtaining data on the progress of the disease on the pine in this plot. The data taken in 1935 and 1936 gave the following results.

Year	Size of plot	Pines on plot	Living pines visibly infected with blister rust	Pines dead from blister rust	Pines visibly infected or killed by blister rust
	: Acres	: Number	: Number	: Number	: Percent
1935---	0.6	1,382	652	29	49
1936---	.6	1,405	772	203	70

It will be noted that there were 23 more pines on the plot in 1936 than in 1935. These were seedlings that appeared during the year. Also, there was an increase of 299 in the number of visibly infected trees and trees killed by blister rust. The apparent increase in the number of infected trees is due to infections that took place in 1933 or 1934, but which did not become visible until 1936 because of the 2-3- year incubation period of the fungus on pines, during which the cankers were becoming large enough to be readily detected. The infections that took place in 1935 will become visible as cankers in 1937, when a further increase in the number of trees visibly infected on the plot may be expected, and this will be followed in later years by the gradual death of the infected trees. After that, the effect of Ribes eradication should be in evidence by the absence of further new infections on the pines. The protection of the healthy pines still remaining in the stand and of the new seedlings now developing will eventually result in an adequately stocked pine lot, notwithstanding the delay in Ribes eradication until after the blister rust had become so strongly established.

COTTON INSECT INVESTIGATIONS

Carry-over of pink bollworm larvae.--Examinations of open cotton bolls collected along the northern coast of Puerto Rico in November and December 1936 by L. C. Fife, of Mayaguez, showed that practically all of the larvae had completed development and that the carry-over of long-cycle pink bollworm larvae in bolls during the midwinter closed season for cotton

was negligible. This is in contrast to conditions in 1935-36 when considerable numbers of resting-stage larvae were found. The explanation seems to be the difference in precipitation. The period from December 1935 to April 1936 was one of the driest on record, whereas during the same period in 1936-37 the rainfall was close to normal. The results of experiments also confirm this conclusion that moisture hastens pupation. During this period "Maga" (Montezuma speciosissima) and "Clamor" (Thespesia populnea) were important hosts and provided a continuous food supply. The infestation in Maga seed pods was 30 percent in November, 22 percent in December, 13 percent in February, and 11 percent in April. Although the percentage of infestation decreased from 30 percent in December to 11 percent in April, there were at least twice as many seed pods per tree in April and the actual decrease in population density was not great. Four mature larvae have been found in one seed capsule and about one-fourth of the infested pods contained two larvae each. The flower buds are also infested but not as heavily as the seed pods, the ratio being about 1 to 4. Buds are produced by Maga during the entire year but only a few mature seed capsules were found during September and they were not numerous until November. As most of the cotton fields had been cleaned and the old bolls burned by December 15, the presence of Maga seed pods filled an important gap in the sequence of host plants. The seed capsules of Clamor were found infested from September 1936 to March 1937. The highest infestation was 14 percent and the average about 4 percent, showing that the pink bollworm can also maintain itself on this host for 4 or 5 months in the absence of cotton. No other plants were found infested during the dead season for cotton. Control of the pink bollworm has been further complicated by the differences in planting seasons on the northern and southern coasts of Puerto Rico, and the laxity in enforcing the closed seasons. On the south coast the cotton crop is fruiting and maturing during the time of the closed season on the north coast; however, steps have been taken by the Puerto Rican authorities, on the Bureau's recommendation, to require uniform planting dates and closed seasons in the two sections for next year.

Thrips damage to cotton.--The variation in thrips injury to 40 different varieties of cotton was studied by E. W. Dunnam and J. C. Clark in experimental plots at Stoneville, Miss., last season. The four species of thrips causing the damage were Frankliniella tritici Fitch, F. fusca Hinds, F. runneri Morgan, and Sericothrips variabilis Beach. Single rows 120 feet long of each variety were planted in eight replicates. The plants in all the plots were thinned to approximately 12 inches in the drill. Six plots were thinned at the usual time and with an average of 2.79 plants per hill; in one plot thinning was delayed a week and an average of 2.03 plants left per hill; and one plot was thinned at the usual time with only 1 plant left per hill to allow full development. In the first series of plots an average of 9.24 percent of the terminal buds of the plants were destroyed by the thrips; in the plot where thinning was delayed a week 20.27 percent of the buds were destroyed; and in the plot thinned at the usual time, with only one plant left per hill, 21.02 percent of the buds were destroyed. Records were kept of the time of fruiting, the yield, and the grades of cotton on the injured plants and nearby normal plants for

checks. There was only a slight delay in the first fruiting of the damaged plants, but there was an average delay of 10 days in setting 75 percent of the crop. Of the 40 varieties 26 showed an average decrease of 1.27 bolls per stalk on the damaged plants, and a loss in quantity of seed cotton. Two varieties had an equal number of bolls on the normal and damaged plants, but a loss in seed cotton. The other 12 varieties averaged a gain of 0.61 boll per stalk on the damaged plants; 6 of those produced a slight gain in seed cotton and 6 a loss in seed cotton. The greatest increase in number of bolls on injured plants for any variety was an average of 1.76 bolls per stalk over the normal plants. Of the 40 varieties under observation there was an average loss of 0.68 boll per stalk, or 7.72 percent on the injured plants. However, there was an average loss of 13.3 percent in weight of seed cotton, which showed there was also a decrease in the size of the bolls on the injured plants. The reduction in boll size apparently influenced the length of the staple, as it was shorter on the damaged plants in seven of the varieties. There was no boll weevil infestation in these plots and it is certain that the thrips loss would have been greater in the damaged plants if weevils had been present, because the bolls were produced later than in normal plants.

Arsenic absorption by plants.--Determinations of the amounts of arsenic in plants grown on soils treated with calcium arsenate have been reported by F. H. Tucker of State College, Miss. Analyses were made of corn, cotton, and soybean plants grown on seven soil types, to which 0, 400, 800, and 1,600 pounds of calcium arsenate per acre had been added. The plots were treated in April, the crops planted on May 3-14, and the plant samples taken on June 25, 1935. The results show the plants absorbed more arsenic on the plots that received the heavier applications, but not in proportion to the amount of soluble arsenic in the soil. Soil type seems to have had little if any influence on the amount of arsenic absorbed by the plants, although the corn plants grown on the Norfolk, Orangeburg, and Sarpy soils contained more arsenic than those grown on the other soil types. The maximum quantity of As_2O_3 found in any sample of corn was 5.8 p. p. m. for the plants from the Sarpy soil treated with 1,600 pounds of calcium arsenate per acre. The maximum for cotton was 10.0 p. p. m. for the plants from the Sarpy soil treated with 300 pounds of calcium arsenate per acre. The maximum for soy beans was 8.0 p. p. m. for the plants from the Memphis soil treated with 1,600 pounds of calcium arsenate per acre.

Cotton flea hopper emergence.--K. P. Ewing and R. L. McGarr report the first emergence of cotton flea hoppers from overwintering eggs in hibernation cages at Port Lavaca, Tex., on February 8, the earliest ever recorded at that laboratory. A total of 143 nymphs emerged in February as compared to none last year and five in 1935 from comparable cages. In March of this year 35,251 nymphs emerged, in comparison to 12,369 in 1936. The high temperatures during part of February and the first half of March caused the early emergence. During the 10-day period March 16-25, approximately 96 percent of the total emergence for February and March occurred. This warm weather was followed by a drop in temperature

and a heavy frost, which killed all of the cotton above ground and caused a corresponding decrease in emergence. The first nymphs found in the fields were first and second instars on Croton texensis plants on February 15. The first flea hopper adult was observed on March 17. No flea hoppers were taken on flight screens during March. H. J. Crawford collected the first flea hoppers of the season at Brownsville, Tex., on February 25 and 26, when 36 nymphs including three in the fourth instar were taken on Tidestromia lanuginosa.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Wild-cotton eradication.--The eradication of wild cotton in southern Florida made excellent progress throughout March. By the end of the month all of the known cotton locations had been recleaned at least once since work was begun in the fall, with the exception of part of the Florida Bay and Cape Sable areas. One of the most encouraging features of the eradication program is the fact that very few seedlings were encountered in the four uppermost west-coast counties. A very unfavorable situation exists on Cape Sable. In a section known as Rollisons Prairie an enormous amount of open cotton was found on seedling plants. Original plans had been to reclean this section in January, but high tides flooded the flats and prevented crews from reaching this cotton. Excellent progress is now being made in recleaning this section. The crews first pick all of the open cotton by hand in order to prevent any of it being shattered to the ground as the plants are being removed. During the month 5,148 acres were recleaned and 47 mature, 160,492 seedling, and 155 sprout plants were removed. A first clean-up was made at five different locations involving only $8\frac{1}{2}$ acres, which contained 73 mature and 448 seedling plants. In addition to the above acreage, 20,228 acres were scouted without finding any wild cotton.

Thurberia-plant eradication.--Very good progress has been made with the eradication of Thurberia plants in the Santa Catalina Mountains of southern Arizona. A total of 2,480 acres was covered and 59,752 Thurberia plants were removed. All of the work was carried on from the camp in Sabino Canyon. By the end of the month practically all of the territory which is readily accessible from this camp had been gone over, and plans are being made to establish a new camp site. At the end of March 99,265 acres had been covered in the Santa Catalina Range and 1,095,856 Thurberia plants had been destroyed.

Laboratory inspection.--The inspection of green-boll samples at the San Antonio laboratory has gone forward as usual, results having been negative to date. As regulatory duties decrease, inspectors at the various field stations have been devoting more of their time to the inspection of material collected within regulated areas. In the lower Rio Grande Valley of Texas inspections were completed the latter part of the month, only one specimen of the pink bollworm having been found. This finding did not involve any new territory, as gin-trash inspection had previously indicated infestation in the field in which this specimen originated. At El Paso,

Tex., a good deal of material has been inspected, most of which was from Hudspeth County, and the results indicate a heavier infestation than the previous year. From 10 samples of 100 bolls each, 508 specimens of the pink bollworm were taken, as compared with 133 specimens from the same number of samples the previous year. A large percentage of the specimens were first- and second-instar larvae. At the other field stations the results have been negative to date.

The Big Bend of Texas.--In the Big Bend a special control program has been used for the past several years. This consisted in a thorough clean-up of fields in the fall, delayed planting of cotton the following spring, so that there would be no fruit until most of the moths had emerged, and the use of small plots of cotton to attract the late-emerging moths. Last fall a number of farmers in Presidio County indicated that they did not care to follow the delayed planting of cotton this spring. This made it inadvisable to carry on a complete field clean-up campaign last fall, and also because of a shortage of funds only the most heavily infested fields were cleaned. No effort has been made to get the farmers to observe the delayed planting date, which has been April 15, and the first cotton was planted on March 17. By the end of the month many of the farmers were planting. In Brewster County the same program has been in effect, but last year a farmer planted 10 acres early to see what the results would be. The cotton was very badly damaged by the pink bollworm and, as this farmer controls all of the cotton acreage in the county, this season he is observing the delayed planting. A trap plot of 1/2 acre was planted on March 8, and by the end of the month was up to a fairly good stand. As soon as the plot cotton begins blooming the blooms will be collected and inspected daily.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Calcium cyanide and nicotine compounds effective against aphid on greenhouse-grown vegetables and flowers.--C. A. Weigel and R. H. Nelson, of the Beltsville, Md., laboratory, report that three successive overnight fumigations with calcium cyanide at intervals of about a week, using a dosage of approximately 3/16 ounce per 1,000 cubic feet, produced mortalities ranging from 96 to 100 percent of the aphid Myzus solani (Kalt.) pseudosolani Theo. on greenhouse-grown lettuce. These observations were made on infested lettuce plants growing in pots placed among lettuce plants growing in ground beds and under conditions simulating commercial greenhouse practice. The main crop was not allowed to become infested, and received four fumigations. Apparently no permanent injury was caused to the lettuce, although weak and stunted plants appeared to be more easily affected by the fumigant than the more vigorous plants. Two tests with a new commercial nicotine fumigation powder prepared especially for greenhouse use in pressure cans were also conducted in the same greenhouse, using 1 pound of the fumigation powder to approximately 21,178 cubic feet of space. This fumigant produced mortalities ranging from approximately 98 to 100 percent of the aphids (M. solani pseudosolani) present on several infested lettuce and tomato plants placed in the greenhouse during the exposure. No

injury was observed on the major crop of lettuce and several hundred tomato plants which were subjected to the exposure. Two other experiments were performed in this same greenhouse with free nicotine (40 percent) at dosages of 152 cc and 125 cc, respectively, atomized into the atmosphere by means of a new nicotine vaporizer developed by the Division of Control Investigations. At the higher dosage this method proved equally as effective against the aphids as did the nicotine fumigation powder and at about half the cost of the latter. No apparent injury was caused to the lettuce, tomato, turnip, cabbage, and nasturtium plants growing in the greenhouse.

Additional breeding areas of beet leafhopper found in Texas.--V. E. Romney, of the Phoenix, Ariz., laboratory, reports that, as the results of a recent survey, additional breeding areas of Eutettix tenellus Bak., involving 2,700 square miles of territory were added to the known breeding areas north of the Rio Grande in Texas. This survey was performed primarily to determine the source of the curly-top disease epidemics in spinach fields. These epidemics have assumed critical importance in the Crystal City district of Texas. Survey data indicate that the source of the leafhoppers that infest spinach fields near Crystal City begins about 30 miles southwest of Dryden, Tex., and continues along the foothills up to the Rio Grande for approximately 360 miles. The beginning of the breeding area is apparently 180 miles west-northwest of Crystal City. Known breeding areas of the leafhopper now occupy approximately 10,700 square miles north of the Rio Grande in New Mexico and Texas, in addition to the unknown extent of adjacent areas in Mexico.

Chalcid parasite tested against greenhouse thrips.--Floyd F. Smith, of the Beltsville, Md., laboratory, reports the following results with the chalcid parasite Dasyiscapus parvipennis Gahan, which is being utilized in the control of thrips, chiefly Heterothrips rubrocinctus Giard. in certain tropical countries. In cage tests, at a temperature of 80° F., it parasitized larvae of Heliothrips haemorrhoidalis Bouche and normal-appearing parasite adults emerged. The parasitized larvae apparently fed normally until fully grown, then they transferred to the first pupal stage before dying. The parasite caused only a slight change in the appearance of the host until the contents of the thorax and the head were consumed. At this stage the host body wall was separated between the meta- and mesothoracic segments and the parasite emerged. These effects on H. haemorrhoidalis differ considerably from those described for H. rubrocinctus. Incidentally, the larvae of the parasite were killed by fumigation with calcium cyanide at the rate of 1 ounce per 1,000 cubic feet, but all of the pupae survived and adults emerged therefrom. Based on experiments thus far, it appears that this parasite apparently required a higher temperature for optimum development than is maintained for the growing of most greenhouse crops, leading to the conclusion that it probably will not be successfully employed for the control of thrips in greenhouses.

Winter survival of tomato pinworm in southern California.--J. C. Elmore, of the Alhambra, Calif., laboratory reports that field observations during the month of March have demonstrated that Gnorimoschema lycopersicella

Busck has survived the winter in large numbers in southern California, even though the longest cold spell on record occurred in this area in January, including a minimum of 22° F. and a total of 17 nights during which the temperatures at Alhambra fell below freezing. Tomato fields were still in production early in December 1936, particularly in the San Onofre locality, and 80 percent of the fruits were infested. These fields were left standing until March 11, when they were disked and plowed. Prior to plowing, an average of five tomato pinworm adults per plant were found to be present in these fields. Heavy adult emergence from old tomato fields was observed at Alhambra and at Santa Ana during this same period.

Sweetpotato leaf beetle an important pest in North Carolina.--As a result of field observations and experiments performed in 1936, L. W. Brannon, of the Norfolk, Va., laboratory, reports that Typophorus viridicyaneus Crotch has developed into a pest of distinct importance in northeastern North Carolina. It has been discovered that half-grown larvae are sometimes present in sweetpotatoes 20 days after they are dug, providing an opportunity for the possible transportation of this insect in newly dug potatoes. Results of cage-toxicity experiments demonstrated that undiluted calcium arsenate was more toxic to the insect than was a derris or cube dust mixture containing 0.5 percent rotenone or a water suspension of ground derris root containing 0.02 percent rotenone. A dust mixture composed of cryolite and talc (60-40) was also highly toxic to this pest.

Cabbage webworm fails to survive winter in North Carolina.--W. A. Thomas, of the Chadbourn, N. C., laboratory, reports that extensive field studies performed during the period from January to March inclusive, have demonstrated that Hellula undalis Fab. failed to survive the winter of 1936-37 in the Chadbourn, N. C., district, although weather conditions in this district have been unusually mild, a minimum temperature of 22° F. being recorded. The present status of the investigations indicates that this insect does not pass the winter in North Carolina in any stage of its development, even when the weather is very mild.

INSECTS AFFECTING MAN AND ANIMALS

Diet for adult screwworm flies.--For feeding adults of Cochliomyia americana C. and P., to maintain a stock of these insects for experimental work, Roy Melvin, of the Dallas, Tex., laboratory, found the following mixture to be the most easily prepared, most economical, and the best food for the flies of all that have been tried: 250 cc of honey are added to 750 cc of hot water containing 50 g of gelatin; then 250 g of ground lean beef are added and the mixture is chilled and stirred occasionally until it starts to congeal. After the diet congeals it is ready to use. This recipe makes sufficient food for 8 to 10 cages of 1,000 flies each. The medium is placed on pieces of waxed paper in the bottom of the cage containing the flies and a water fountain and needs no attention for a week. It remains good for 3 weeks if kept in a refrigerator.

Effects of soil-and-debris accumulation over mosquito eggs.-- H. H. Stage and C. M. Gjullin, of the Portland, Oreg., laboratory, have found that many eggs of Aedes are laid at relatively high levels where normal floods do not reach. Perhaps the eggs are not flooded for a period of several years, in which case they are gradually covered with debris, particularly leaves, and sometimes soil. Tests have been made in the laboratory using soil samples containing eggs and covering such samples with varying depths of egg-free soil. The results were compared with check samples. Those samples covered with 1/2 inch of soil hatched but 2.8 percent of the eggs of A. vexans Meig. and 3.2 percent of those of A. aldrichi Dyar and Knab. After the egg-free soil was removed and the samples were dried and reflooded most of the remaining eggs hatched. Samples covered with but 1/4 inch of egg-free soil produced 47 percent A. vexans and 54 percent A. aldrichi larvae. It is probable that soil samples covered with a light covering of leaves and debris from one to several years old would show little or no reduction in the numbers of eggs hatching.

Influence of pH on hatching of mosquito eggs.--Preliminary tests made by Messrs. Stage and Gjullin have shown that eggs of A. vexans and A. aldrichi, flooded by neutral tap water might not hatch, whereas eggs hatched readily when flooded by an infusion of dead leaves. The pH of such infusions was 6.5 or less. Further work has shown that when soil samples are flooded with water made alkaline with calcium hydroxide to pH 8.6, a normal hatch occurred. The alkalinity of the water was reduced somewhat by acids developing from the soil of the sample, but the liquid was still alkaline after the eggs had hatched. It appears, therefore, that the eggs had acquired the ability to hatch by contact with the acid pH of the moisture in the soil before flooding or that some ingredient of the water, rather than its acidity, was responsible for causing the eggs to hatch.

Effect of daylight on development of mosquito eggs.--Samples of soil containing eggs of Aedes vexans and A. aldrichi have been kept in complete darkness and in varying numbers of hours of artificial light since the early fall of 1936. To date no appreciable difference has been noted in the numbers of larvae hatching when such samples were flooded. Interesting data on this have been obtained from eggs laid under controlled conditions. One hundred and sixty-two A. vexans eggs were laid by fed females in the laboratory in August 1936, and 10 days later were placed under out-of-door conditions in complete darkness. During February 1937, approximately 180 days later, the eggs were brought to the laboratory, warmed, and flooded. All eggs hatched with the first flooding. These eggs had not been exposed to daylight for more than a few minutes during the 180-day period.

FOREIGN PARASITE INTRODUCTION

Predacious elaterids shipped to Mauritius.--During the period from October 1936 to January 1937 a total of 11,281 field-collected larvae of Pyrophorus luminosus Ill. were shipped by K. A. Bartlett from Puerto Rico to Farnham House Laboratory, for forwarding to Mauritius. Of this number

8,127 reached England alive and were repacked and shipped to the final destination. The costs of these collections were defrayed by the Mauritius department of agriculture. Pyrophorus is predacious on white grubs in Puerto Rico and is being colonized in Mauritius against Phytalus smithi Arrow, a destructive pest of sugarcane.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Two living larvae of the Mediterranean fruit fly (Ceratitis capitata Wied.) were taken at New Orleans on November 11, 1936, in an orange in ship's stores from Brazil. A living specimen of Echinothrips mexicanus Moul. arrived at Brownsville, Tex., on October 13, 1936, on a gardenia in cargo from Mexico. Living adults of Callosobruchus ademptus (Sharp) were taken at San Francisco on January 7 in seed of kudzu bean (Pueraria thunbergiana) in the mail from Japan. A living specimen of Frankliniella formosae Moul. arrived at Baltimore on October 10, 1936, on a leaf of Japanese cabbage (Brassica chinensis) in ship's stores from Japan. This represents the first record in our files of this thrips being intercepted. Living adults of Callosobruchus chinensis (L.) were found at Washington, D. C., on December 29, 1936, in dried beans in the mail from British Guiana. Living larvae of the turnip gall weevil (Ceutorhynchus pleurostigma Marsh.) were intercepted at Philadelphia on December 28, 1936, in rutabaga (Brassica campestris) roots in ship's stores from the Netherlands. A living adult of the weevil Brachyrhinus scaber L. arrived at New York on November 6, 1936, on soil around gladiolus corms in baggage from Germany. A living specimen of the cicadellid Opsius stactogalus Fieb. was taken at Brownsville, Tex., on January 4 on a rose cutting in baggage from Mexico. A living adult of Baris chlorizans Germ. was intercepted at Port Arthur, Tex., on December 22, 1936, in a turnip in ship's stores from France. This weevil is reported as severely infesting cabbage and cauliflower in Poland.

Pyralid in St. Johnsbread.--A living larva of Myelois ceratoniae Zell. was intercepted at New Orleans on December 30, 1936, in a pod of St. Johnsbread, or carob (Ceratonia siliqua), in a cargo shipment from Cyprus. C. Heinrich reports that this species is found throughout the entire Mediterranean region, in Africa, Madagascar, and Puerto Rico. M. decolor Dyar, which is a synonym of M. ceratoniae, occurs in Florida, Central America, French Guiana, and the West Indies. The hosts include almond, walnut, tamarind, loquat, and quince.

Pink bollworm in okra.--Living larvae of the pink bollworm (Pectinophora gossypiella Saund.) were intercepted at New York on January 19 in okra (Hibiscus esculentus) pods in the mail from the Virgin Islands. On June 26, 1936, a living larva and a dead pupa of the pink bollworm were intercepted at New York in the "webbing" together of several seeds of sunset hibiscus (Hibiscus manihot) in a shipment in cargo from Brazil.

Pathological interceptions of interest.--Some of the interceptions listed here appear to be new species of fungi, others are on new or unusual hosts or from countries new to our interception files. Ascochyta conorum

P. Henn. was intercepted on Picea excelsa cones in baggage from Germany on March 8 at New York. Botrytis narcissicola Kleb. was intercepted on narcissus bulbs from Holland on September 30 and October 1, 1936, at New York and from England on December 3 at San Francisco. Cercospora nicotiana E. & E. was intercepted on tobacco leaves in cargo from Cuba on February 10 and from the Philippine Islands on March 24 at New York. Cercospora sp., no species found listed on host, probably new, was found on leaves of Tradescantia sp. from Mexico on September 22, 1936, at Eagle Pass. Cladosporium vigneae M. W. Gardner was found in a cargo shipment of black-eyed peas from Cuba on February 3 at Miami. Coniosporium sp., unlike species reported on bamboo, was found on a bamboo stake in a shipment of plants from Canada on November 17, 1936, at Seattle. Didymella sp., unlike species described on rose, was intercepted on manetti rose stocks from Holland on December 9 at New York. An immature ascomycete, apparently of the genus Didymella, was found on October 6, 1936, on Cereus chlorocarpus from Peru offered for entry under special permit at San Francisco. Diplodia cacaoicola P. Henn. was found on Cucumis anguria in baggage from Virgin Islands. We have had no previous interceptions of the fungus on any species of Cucumis or Cucurbita. Diplodiella oryzae Miy. was found on rice hulls in stores from Japan on March 16 at New York. Gloeosporium pruinatum Bauml. was intercepted on February 6 on Veronica guthricana from England at the inspection house in Washington. Helminthosporium allii Campanile was intercepted on garlic from Peru at New York on March 11. Mosaic was found on Swiss chard leaves from Italy on February 5 at New York. Mycosphaerella citrullina (Smith) Gross. was found on pumpkins from Australia on February 10 and on vegetable marrow from New Zealand on March 4 at Norfolk. Nectria sp. was intercepted in a shipment of water chestnuts (Eleocharis tuberosa) from China on March 9 at New York. Paraphelenchus pseudoparietinus Micl. was intercepted in New York September 11, 1936, in narcissus from Holland. A disease of rice hulls from Japan intercepted at New York last July has been tentatively determined as Phaeoseptoria oryzae Miy., although the spores are rather short for the species. A species of Phoma intercepted at San Francisco on April 24, 1936, on Hoodia spp. (or Huernia Bainnii and H. zebruna) and Taveresia Bainnii from South Africa could not be determined. Additional material was received and has been studied. The species has not been determined, but is not P. stapeliae Kelch. & Cke. Phomopsis batatae (E. & H.) Harter and Field was intercepted on January 25 at New York on sweetpotatoes from Japan. Phomopsis sp., no species described on Cymbidium, was found causing a leaf spot of C. pendulum from India on May 11, 1936, at San Francisco. Phyllosticta sp., unlike any species reported on rice, was found on rice straw from Ceylon on April 30, 1936, at New York. The Puccinia on bamboo from China mentioned in the March 1, 1937, News Letter (vol. 4, no. 3, p. 19) has been assigned to the species P. mitriformis Kusano by Dr. Cummins, with notes covering discrepancies between the specimen and the description of this species. Puccinia sorghi Schw. was found in a cargo of corn from Argentina, first interception from South America, on February 2 at New York. A Sclerotium sp. found in shipments of narcissus from Holland last fall at New York is thought to be the form called "small scale-speck" reported from England by Alcock and from the United States by McWhorter and Weiss. Septoria acicola (Thum.) Sacc.

was intercepted on pine needles from Germany on December 18, 1935, at New York. Diseased passion fruit from Maderia Islands intercepted February 3 at New York bore fruiting bodies resembling those of Phomopsis but with hooked stylospores only. The fungus is very close to what has been called Septoria fructigena B. & C. A tomato severely disfigured by "Streak", a virus trouble, was intercepted at Nogales on February 23 among tomatoes from Mexico. Uromyces lespedezae-procumbentis (Schw.) Curt., so called (see News Letter, vol. 4, no. 3, March 1, 1937, p. 20) was intercepted February 25 on leaves in seed of Lespedeza formosa from Japan in cargo, at Seattle. Volutella sp., unlike any described species apparently, was intercepted on February 25 at Baltimore on sour oranges (Citrus sinensis) from Japan.

Rot of melons from Chile.--A sterile fungous rot of melons from Chile, intercepted on a number of occasions at New York and reported as Sclerotium bataticola Taub. on page 20 of the News Letter dated July 1, 1935 (vol. 2, no. 7), has now been determined as Rhizoctonia bataticola (Taub.) Butler by the specialists who have been studying the disease. R. bataticola has been reported from different parts of the world but its identity and the limitations of the species are a matter of controversy. The disease was found at New York on one or more melons in several shipments from Chile and Argentina during March.

DOMESTIC PLANT QUARANTINES

No canker found at old infection center.--A thorough reinspection was made in Jefferson County, Tex., during the last week in March of an area where 625 trees infected with citrus canker of several years' standing were discovered on 6 properties in the winter of 1935-36. No disease was found in the recent reinspection. Properties adjoining the infected area were reinspected and, while it appears that the disease may have been eradicated, repeated inspection of the area will be continued. Thirty-three inspectors are employed in making reinspection of all other citrus-growing districts of Texas, Louisiana, Mississippi, and Alabama.

Peach mosaic control work.--Preliminary to starting eradication of abandoned and diseased peach trees in New Mexico, 4 inspectors are completing a presurvey of peach-growing properties in the infected counties of the State, the peach mosaic disease having been located in 10 counties in the Rio Grande drainage area of the State in the field season of 1936. Tree-removal work was carried on in the infected districts in California throughout the winter. The 1937 inspection work will be started in Arizona, California, Colorado, New Mexico, and Texas in April.

Colorado establishes quarantine on peach mosaic disease.--Effective March 15, the State of Colorado placed a revised quarantine prohibiting the movement of host plants of the peach mosaic from the infected area in that State, unless accompanied by a State certificate showing a disease-free zone of 5 miles around the nursery and the source of budding wood. Quarantines relating to the disease have also been placed by Arizona, California, Oregon, Utah, and Texas.

Change in field headquarters for phony peach disease control.--The field headquarters for phony peach disease control were recently moved from Atlanta, Ga., to Little Rock, Ark., with offices at 410 National Standard Building, 212 Center St. A. E. Cavanagh is the project leader.

Work on phony peach disease control.--The project leader reports that since the reduction of the relief force from 900 to 700 men in March, he has received more requests for tree removal, and even more enthusiastic support of the work, than heretofore. Eradication was conducted during the winter in Alabama, Arkansas, Georgia, Illinois, Missouri, North Carolina, South Carolina, Tennessee, and Texas, comprising the removal of about 2,000,000 peach trees a month. The work is being completed or closed in several counties and a concentrated drive made to remove worthless peach trees from the vicinity of infected properties, nurseries, and commercial orchards, taking advantage of the blossoming season to readily find the wild trees.

Enormous production in pine-growing nursery.--"Ten million seedling trees will be the annual capacity of the Savenac nursery, near Haugan, Mont., which provides the forest planting stock for the northern Rocky Mountain national forest region, upon completion of current improvement work", according to the American Nurseryman of March 1, 1937. This is one of the Forest Service nurseries in which five-leaved pines are protected by the Bureau from white pine blister rust, as a prerequisite to interstate movement under the provisions of Quarantine 63. "Established in 1909", the article states, "the original nursery comprised 26 acres. By the new development work, already more than half completed by C. C. C. labor, the area will be extended to 90 acres. It is said that 170,000 acres of land needs to be planted in the region, so there is 15 years' work ahead. The nursery output is about 45 percent ponderosa pine, 35 percent western white pine, and 20 percent other species, such as Douglas fir and spruce."

Transit inspection activities.--Supplementing the regular force, some 20 men have assisted in transit inspection in the spring nursery stock shipping season at Chicago, Omaha, Kansas City, St. Louis, Indianapolis, Detroit, St. Paul, New York, Springfield, and Boston. Six of the men are State inspectors and the others have been assigned for seasonal work from projects of this Bureau relating to Japanese beetle, European corn borer, barberry eradication, and white pine blister rust.

Cincinnati's March shipping approaches Christmas peak.--With passenger trains operating in two sections, storage mail averaging more than 700 feet daily, line loadings of freight cars showing a weekly increase of more than 1,000 cars, and express showing a similar increase, the volume of traffic through Cincinnati is similar to that of the Christmas season, the inspector reports. Nursery stock shipments were seen from about 40 States.

New map-illuminating device.--A new type of frame for illuminating maps of field activities was recently devised by J. M. Corliss, transit inspector in charge of Middle Western stations. The aluminum frame holds maps

64 by 44 inches. Colors are effected by pasting green and red Scotch cellophane on the back of the map to indicate field activities. When the lights in the frame are turned on, these colors make a brilliant display. The frame and tripod are collapsible, and can be carried or shipped in the specially constructed case of light fiber.

Pink bollworm quarantine regulations revised.--Effective April 6, the regulations of the pink bollworm quarantine were extended to include Sierra County, N. Mex., and the Texas counties of Crane, Loving, Upton, and Winkler, in the lightly infested area. While the principal industry of these counties is stock raising, a small amount of cotton is grown and this is moved into the present adjacent regulated areas for ginning. This action is therefore taken to allow the movement of seed to farms and ranches in these counties for planting and feeding purposes.

INSECTICIDE INVESTIGATIONS

New publication on Tephrosia.--Derris and cube have come into extensive use in recent years as agricultural insecticides. Figures recently issued by the United States Department of Commerce show that during 1936 this country imported 913,277 pounds of crude derris root, 695,222 pounds of crude cube root, and 944,099 pounds of ground timbo, the total valued in excess of \$350,000. Assuming an average rotenone content of 4.5 percent, this quantity of derris and cube root would make 15,315,588 pounds of insecticide dust containing three-fourths of 1 percent rotenone. This strength has been found effective for the control of cabbage worms and the Mexican bean beetle. Another genus of leguminous plants, namely Tephrosia, contains rotenone, deguelin, and the other insecticidal constituents of derris and cube, but to a lesser degree. About 150 species of this genus are known and they are distributed all over the world except in Europe. Twelve species of Tephrosia have been found to contain rotenone or deguelin and 15 species show insecticidal value when sprayed on aphids or certain other insects. Certain specimens of Tephrosia virginiana, called the devil's-shoestrings, from Eastern Texas, have been found to contain 4 percent crude rotenone. Efforts are now being made by the United States Department of Agriculture, in cooperation with the Texas Agricultural Experiment Station, to propagate high rotenone strains of Tephrosia virginiana. All the data concerning those species of Tephrosia found to have insecticidal value are reviewed in a recent publication by R. C. Roark, entitled, "Tephrosia as an Insecticide--A Review of the Literature", B. E. P. Q. E--402, 165 pp., Feb. 1937).

BEE CULTURE

Steps to protect bees from insecticides.--Frank E. Todd, of the Pacific States laboratory at Davis, Calif., reports that the California State Department of Agriculture has held a hearing concerning a regulation to govern the spread of insecticides. One of the aims of the regulation is to insure beekeepers and stockmen better information as to when and where dusts are to be applied. The hearing was well attended by beekeepers, insecticide manufacturers, and airplane dusters. The meeting undoubtedly gave all parties concerned a better acquaintance with the various problems, and it is expected

that a solution fair to all sides may eventually be accomplished. The more practical side of what the beekeeper is to do to protect his property was not covered.

Special introduction method reduces non-laying period of package queens.--A. P. Sturtevant, of the Intermountain States laboratory at Laramie, Wyo., reports that the most significant result found during the past quarter in the analysis of data accumulated during the supersedure studies on package bees shows that an average of 4.2 days was required for 549 package queens to begin laying, when established by the usual methods, whereas queens introduced in 20 packages by a special method began laying within 12 to 20 hours.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Bruchid added to National Collection.--Specimens, identified as Bruchus hamatus Miller by H. S. Barber, were recently received through the Division of Foreign Plant Quarantines. They emerged from legume seeds coming from Turkey in connection with activities of the Foreign Plant Introduction Division of the Bureau of Plant Industry. B. hamatus is one of the least-known species of the genus and its food plant has not been recorded. Unfortunately, the seeds making up the sample from which the present specimens emerged represented several different species of plants, making definite determination of the host impossible.

Erroneous sawfly host record corrected.--In the course of some preliminary studies of the North American species of sawflies belonging to the genus Neodiprion, Grace Sandhouse has discovered that N. abietis (Harris) does not occur on spruce (Picea), although it has been so reported during most of the period since its description in 1841. Studies of series of specimens reared from fir (Abies) and spruce show that two distinct species are involved. The form occurring on spruce is apparently undescribed. It may be recorded, incidentally, that, according to Miss Sandhouse, another seemingly undescribed species of Neodiprion occurs on Pinus resinosa, specimens having been received from Maine and Massachusetts.

Another European leaf-hopper recorded from United States.--Specimens of a Macrosteles (Cicadula auct.) collected at Puyallup, Wash. (from Equisetum growing along the river, July 5, 1935, Oman) have been tentatively identified by P. W. Oman as ramigera Zachvatkin, a species described from the North Caucasus region of the Union of Soviet Socialist Republics. The Puyallup specimens agree with Zachvatkin's description and illustrations of ramigera, which has unusual characters in the internal genital pieces of the male.

Specific differentiation in certain leaf hoppers.--In connection with the determination of some leaf hopper material belonging to the genus Macrosteles (Cicadula auct.), P. W. Oman has had occasion to examine critically a considerable number of European specimens of the sexnotata complex. H. E. Dorst, in a paper now in press, points out that the North American species divisa Uhler is not identical with the European sexnotata Fallen, as

has been supposed, and gives some characters for the differentiation of the two forms. Mr. Oman's observations confirm Mr. Dorst's conclusions and bring to light an additional structural difference in the two species. This difference is in the sternal apodemes at the base of the abdomen of the male, which, in sexnotata, are well developed and prominent, but in divisa are rudimentary. The same character will also differentiate divisa from fieberi Edwards and laevis Ribaut, which are European forms belonging to the sexnotata complex.

A new grass coccid record.--An Asiatic grass coccid, Antonina indica Green, has been identified as present in America on the basis of specimens from Echinochloa colonum, collected at Santiago de las Vegas, Cuba, on February 1, 1937, by S. C. Bruner, and submitted by him for determination. The species has been reported previously from India, Formosa, Sumatra, Ceylon, Hawaii, Philippine Islands, and Kenya, Africa.

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ADMINISTRATION

Enforced pest control in Germany.--With the view to expanding the national agricultural output to maximum levels, new legislation was enacted in Germany on March 5, empowering the Minister of Foodstuffs to enforce the use of insecticides and to institute other crop-protective measures for combating plant pests and diseases, says a report from Consul Sydney B. Redecker, Frankfort-on-Main, to the Commerce Department. The new legislation is designed to reduce the heavy agricultural losses from pests and diseases, estimated at from 60 to 80 million dollars per annum, thus lessening the nation's dependency on foreign countries for foodstuffs, the report states. Under provisions of the decree the Reich Minister of Foodstuffs is endowed with far-reaching powers, such as requiring farmers to allow officials to inspect their lands and stocks where infection is suspected; the destruction of infected crops and agricultural products, as well as the disinfection of soil, warehouses, and equipment; and the institution of other measures designed to reduce pests and diseases, including the rotation of crops.

FRUIT INSECT INVESTIGATIONS

Effect of paradichlorobenzene on Japanese beetle larvae.--W. E. Fleming, of the Moorestown, N. J., laboratory, has recently completed a series of experiments on the horizontal penetration of paradichlorobenzene vapor into moist sassafras sandy loam at temperatures ranging from 45° to 70° F. In these experiments, which were begun in November 1936, 14,600 larvae have been used to determine the penetration into masses of soil 2 inches thick, 24,800 larvae in masses 4 inches thick, 28,800 in masses 6 inches thick, 33,600 in masses 8 inches thick, and 42,000 in masses 10 inches thick. The larvae were confined in the soil in such a manner that each cubic inch of soil contained one. This procedure eliminates the error which is introduced when larvae migrate from the most remote point to the areas nearer the source of the gas. It has been found that a concentration of 20 pounds of crystals per cubic yard of plunging soil is no more effective than 10 pounds. Decreasing the concentration to 5 pounds tends to increase the exposure over that required in the 10-pound treatment 1 day in the 2-inch masses, and for longer periods in larger masses of soil. The 1-pound treatment was found to be largely ineffective.

Japanese beetle larvae as food of sea gulls.--In recent years it has been noted that great numbers of sea gulls (Larus argentatus) come into the sections of southern New Jersey adjacent to Delaware Bay in the spring to feed on larvae of the Japanese beetle turned up when cultivated fields are plowed for spring planting. F. A. Raymaley, county agricultural agent for Cumberland County, N. J., has recently forwarded a report on examinations made by the Bureau of Biological Survey of the stomachs of two gulls caught by him. Both stomachs contained practically 100 percent of animal matter, with a trace of vegetable matter. One contained approximately 10 percent of gravel (mud and dirt) and the other 5 percent of gravel. The contents of the two specimens as listed were found to be as follows: (1) 260+larvae of Popillia japonica, 95 percent; 7 larvae of Monocrepidius sp., 1 percent; 15 larvae of Melanotus sp., 2 percent; 12 larvae of Carabidae, 1 percent; 1 Carabidae, tr.; skin of a fruit, possibly Solanum carolinense; mud and dirt. (2) Popillia japonica, 555+larvae and 1 adult, 95 percent; 8 Annelida, 5 percent; other Coleoptera--1 Scarites subterraneus, 1 Poecilus lucublandus, 2 Leiocnemis avida, each a trace; 1 Asilus (?) sp. larva, 1 Anatidae (duck) feather, each a trace; 2 small pieces wood, trace; 2 Bombyliidae larvae, trace.

Survey of infestation in stored raisins.--A report by H. C. Donohoe of the Fresno, Calif., laboratory, on examinations of 106 samples of raisins, shows the condition of the fruit at the end of winter. The sampling was done between February 16 and March 9 at six commercial storage plants and included raisins of the 1935 and 1936 crops. In addition to the pests recorded below, adults of Microbracon hebetor Say, an abundance of book lice, and a few mites were found.

Insect	Infestation per ton--					
	1935			1936		
	Thompson:	Sultana:	Thompson:	Sultana:	Muscat	
	seedless:		seedless:			
<u>Ephestia figulilella</u> Greg.	:	:	:	:	:	:
(larvae)-----	562	:	583	:	4,124	:
<u>Plodia interpunctella</u> Hbn.(lar-	:	:	:	:	:	:
vae)-----	269	:	638	:	226	:
<u>Vitula serratilineella</u> Rag.	:	:	:	:	:	:
(larvae)-----	0	:	50	:	0	:
<u>Ephestiodes nigrella</u> Hulst	:	:	:	:	:	:
(larvae)-----	0	:	0	:	35	:
<u>Cryptophagus insoitus</u> Csy. 1/	:	:	:	:	:	:
(larvae, pupae, adults)-----	3,463	:	276	:	553	:
<u>Oryzaephilus surinamensis</u> L.	:	:	:	:	:	:
(adults)-----	29,388	:	49,333	:	2,137	:
<u>Enicmus protensicollis</u> Mannh. 1/	:	:	:	:	:	:
(adults)-----	209	:	0	:	34	:
<u>Cryptolestes ferrugineus</u> Steph.	:	:	:	:	:	:
1/(adults)-----	995	:	104	:	0	:
<u>Tribolium confusum</u> Duv.(adults):	174	:	0	:	0	:
Dermestids (larvae and adults)-:	1,098	:	1,763	:	0	:
% All species-----	36,158	:	52,747	:	7,109	:
		:		:	11,236	:
		:		:	9,122	:

1/Identifications tentative.

MEXICAN FRUIT FLY CONTROL

Conditions in the lower Rio Grande Valley.--During the latter half of April flies began to emerge from known infested properties and by the end of the month traps had taken a total of 1,491 adult Anastrepha ludens Loew.

The usual tree-to-tree inspection was approximately 50 percent completed by the first of May. Scattering fruit collected on 209 properties during these inspections was found to be infested. All of these properties have been cleaned of fruit susceptible to infestation and no known larval infestation remains within the area. The following table shows the results of trapping and field-inspection work throughout the month. All of the adults and larvae were taken on the Texas side of the Rio Grande.

Species	Adults trapped	Larvae collected
	Number	Number
<u>Anastrepha ludens</u> -----	1,491	2,132
Premises-----	191	209
<u>Anastrepha acidusa</u> -----	1	--
Premises-----	1	--
<u>Anastrepha</u> sp. "Y"-----	12	--
Premises-----	11	--
<u>Anastrepha pallens</u> -----	919	--
Premises-----	200	--
<u>Toxotrypana curvicauda</u> ---	6	--
Premises-----	6	--

CEREAL AND FORAGE INSECT INVESTIGATIONS

Varietal resistance of sweet corn to European corn borer.--M. Schlosberg and R. Mathes, of the Toledo, Ohio, laboratory, report that out of a total of 175 strains of sweet corn tested in 1936 for resistance to the European corn borer, 9 inbred and 14 hybrid strains were determined to possess sufficient indication of corn borer resistance, on the basis of the difference between their expected and observed populations, to continue them in further tests. The strains selected for additional study of resistant plant characters are as follows:

Source	Pedigree	Kind
<u>Inbred lines</u>		
Minnesota-----	26-34	Bantam
Do-----	13-34	Do.
Iowa-----	45	Do.
Do-----	9	Do.
Connecticut-----	C7	Do.
Michigan-----	351828	Do.
Ohio-----	sg206-2-1-5	Do.
Iowa-----	1434	Country Gent.
U. S. D. A.--Purdue-----	1009-2	Evergreen
<u>Hybrid single crosses</u>		
Minnesota-----	38-28 X Gold. Bant.	Bantam
Do-----	6-34 X Gold. Bant.	Do.
Do-----	26-34 X Gold. Bant.	Do.
Iowa-----	Gold. Sun. X 45	Do.
Do-----	51 X 30	Do.
Michigan-----	351807 X 351085	Do.
Iowa-----	900 X 1445	Country Gent.
Do-----	1389 X 1434	Do.
Do-----	12E X 1248	Evergreen
Do-----	12E X 191	Do.
Do-----	1363 X 191	Do.
Illinois-----	13 X 11	Do.
Do-----	11 X 14	Do.
Maryland-----	Ev. X H146-1-1-1	Do.

Relative numbers and growth of borers in resistant and susceptible field corn, with stage of plant development.--According to L. H. Patch and G. T. Bottger, Toledo, in their 1936 experiments both numbers of borers and per-borer weights of larvae surviving on the resistant single-cross field-corn strain R4 X Hy were lower than those on the susceptible strain A X Tr. Also, immature corn offered more adverse conditions for borer survival, and the growth of the borers that did survive on immature corn was inhibited. On the basis of plant maturity, three nearly equal classes were made. In the first class, comprised of plots with plants from 60 to 147 cm tall, planted on the mean date May 26 and infested on the mean date July 7, only 37.7 percent as many borers were dissected from resistant R4 X Hy as from susceptible A X Tr. In the second class, made up of plots with plants from 150 to 185 cm tall, planted on the mean date May 21 and infested on the mean date July 16, only 45.2 percent as many borers were dissected from R4 X Hy as from A X Tr. In the third class, comprised of plots with plants from 186 to 213 cm tall, planted on the mean date May 14 and infested on the mean date July 21, only 71 percent as many borers were dissected from R4 X Hy as from A X Tr. It was estimated that borers 30 days old dissected from the immature plants of A X Tr had attained 23 percent of their mature weight, as compared with 33 and 67 percent, respectively, from the average and most

mature corn of the same strain. As an average of all the corn, the borers in A X Tr had attained 41 percent of their ultimate weight at 30 days old, and the borers in the resistant strain R4 X Hy weighed 75.6 percent as much as those in the susceptible A X Tr.

Immortation of European corn borer parasites.--C. A. Clark and E. D. Burgess, of the Moorestown, N. J., laboratory, report that 85,280 corn borer larvae were imported from Italy last fall and winter to supply principally adults of the parasite Chelonus annulipes Wesm. for liberation this summer. It is estimated that 7.8 percent of the larvae are parasitized by C. annulipes, 1.1 percent by Inareolata punctoria Roman. and 6.4 percent by Lydella stabulans var. grisea R. D.

Hessian fly survival in Kansas and Missouri.--E. T. Jones, of the Manhattan, Kans., laboratory, reports that limited surveys of fall hessian fly infestation in selected wheat fields in southeastern and central Kansas and southwestern Missouri indicate a comparatively light infestation over that area. Should weather conditions favor fly activity the pest may build up considerable infestation in some localities this spring. Results of puparia dissections from the moderate-to-strong fall infestations in our hessian fly-resistance test plots show a generally high winter survival, except at Junction City where nematodes injured or destroyed many larvae.

Locality	Date	Larvae		Pupae		Total
	of	Unhealthy	Parasitized	Healthy	or dead	sur-
	dissection:	Healthy	or dead	ized		vival
		Percent	Percent	Percent	Percent	Percent
Springfield, Mo-----	April 1	58	12	0	30	88
Manhattan, Kans-----	April 2	80	2	0	18	98
Junction City, Kans--	April 7	46	20	0	34	80

Dispersion of hessian flies from field reservoirs.--Mr. Jones also reports that in a study of hessian fly infestation reservoirs some interesting figures were obtained on the dispersal of fall-brood flies. Last summer the 1936 crop stubble in the bottom of a swale near Junction City was found to contain a 70-percent plant infestation, whereas in the rest of the field the infestation was less than 5 percent. On April 6 four areas at varying distances from the west edge of the swale were sampled and examined for infestation with the following results:

Distance	Plants	Range of
from swale	infested	plants infested
Feet	Percent	Percent
5 to 10-----	44.0	40-48
25 to 30-----	17.0	11-23
45 to 50-----	7.7	6-9
95 to 100-----	3.3	3-4

The data obtained tends to support the theory that most general infestations of hessian fly develop from a few flaxseeds sparsely scattered in fields, rather than from fly reservoirs; however, pockets of infestation may play an important part in local outbreaks.

Upward migration of grubs in southern Wisconsin.--T. R. Chamberlin, L. Seaton, John A. Callenbach, and C. L. Fluke, of Madison, Wis., report that no upward movement of the grubs was indicated by diggings in the sample pastures at Lamont and Gays Mills late in April. By May 6 most of the grubs were already in the upper 10 inches of soil at both Gays Mills and Lamont. Plowing and digging in stubble fields and sod east of Leeds, near the southern edge of Columbia County, showed that most of the grubs were in the upper 6 inches by the end of the month. Most of the larvae found in this section were Phyllophaga rugosa Melsh.

JAPANESE BEETLE CONTROL

Control work started at isolated beetle infestations.--Application of lead arsenate to infestations in Detroit, Mich., was resumed on April 6. During 1936 lead arsenate was applied to 36.2 acres between April 30 and June 3, and 48.2 acres were treated from October 6 to November 6. Treatments now in progress will be extended to cover an additional 50 to 60 acres. Control work in Detroit is being performed as a local W. P. A. project. A representative of this Division is working with the treating crews but acts in an advisory capacity only. In Marietta, Ohio, where 121 beetles were trapped last summer, 16.7 acres were sprayed with lead arsenate between April 15 and 24. Assurances, received from the Ohio officials prior to issuance of the March 1, 1937, revision of the Japanese beetle quarantine regulations, that soil treatments would be made in Marietta early this spring, permitted exclusion of Marietta from the extension of regulated territory in Ohio. Treating operations in Indianapolis, Ind., got under way on April 22, and similar work began in Erie, Pa., on April 29. Resumption of soil treatments in Chicago, Ill., is scheduled for May 3. Treatments started in Chicago on August 24, 1936, had covered 93.5 acres before they were discontinued because of freezing weather on November 16. Approximately 50 acres still remains to be treated in Chicago in order to cover the sections in which 3,740 beetles were trapped last summer.

Traps being set in Southern States.--Japanese beetle trapping got under way for the 1937 season when a trap supervisor from the Bloomfield, N. J., field headquarters drove to Miami, Fla., late in April to make arrangements for setting the 800 traps to be operated in that city this season. These traps were set between April 21 and 26. The supervisor then proceeded to Tampa, where distribution of an additional 800 traps started on April 23. Local men are employed in each community to tend the traps. The trap supervisor will work north, supervising the establishment of trap routes in Orlando and Pensacola, Fla., and additional points in Alabama and Louisiana. When all routes are established, this supervisor will continue to operate in this territory until the trapping program in the South is concluded after traps have been in operation in each community for a 30- or

40-day period. Another trap supervisor will later start the trapping work in Jacksonville, Fla., Georgia, and part of South Carolina. Most of South Carolina, all of North Carolina, and southern Virginia will be under a third supervisor.

Trap manufacture.--By the addition of some unique devices, a number of machines have been adapted to large-scale production of the light-weight scouting trap, 100,000 of which are in process of manufacture at the Bloomfield headquarters. The metal stampings are cut from coated black plate by a 20-ton punch press. By the adaptation of a lock-seamer machine to the trap requirements, funnels are locked and seamed in a single operation, whereas previously these operations were performed separately. An automatic wire former, developed and built by divisional employees, is turning out 60 "S" hooks per minute. Another machine is now being constructed to automatically press the flat baffle stampings into right-angled baffle halves. An endless belt leading from the punch press will feed the flat baffle stamping into a slot of the forming machine. Weight of the baffle will complete an electric circuit and a cross arm will bend the baffle at right angles. Completed pieces fall out and are stacked as they are counted and placed in shipping containers. Construction of the season's supply of scouting traps will probably be completed by June 15.

Work in new extensions.--Extension of the Japanese beetle regulated area to include the city of Buffalo and immediately adjacent sections has added 21 classified nurseries and greenhouses to the northern New York area. In the Ohio regulated zone 36 nurseries and greenhouses have applied for and received classification. Since scouting of nurseries and greenhouses during 1936 in the vicinity of the Ohio infestations gave negative results, all establishments in the newly regulated area of that State are entitled to class I status, provided they conform to the regulations in other respects. One of the experienced inspectors from the Philadelphia district has been transferred to the recently enlarged West Virginia area. Desk space for this inspector has been provided in the county agent's office in the courthouse building at Clarksburg. During the month nursery and greenhouse establishments were canvassed in the two magisterial districts in Chesterfield and Princess Anne Counties, Va., that were added to the regulated area on March 1 last.

Chemical treatments in New York City area.--Nurserymen and sand shippers in the New York City district are gradually availing themselves of the various chemical treating procedures by which products that have been subject to Japanese beetle infestation may be freed of larvae and made eligible for certification. Shippers in this area are in more or less of a transitional stage between the preferred status to which they were entitled while they were free from infestation and the imposition of the more rigid supervision necessary following the finding of infestations on their premises. Six soil fumigations and treatments were made in this district during the month. Included in the treatments were 5 tons of molding sand destined to the Panama Canal, and 1,270 pounds of soil to be used at various western agricultural experiment stations, in connection with

research on potato scab. Poor penetration of carbon disulphide in a soil block containing azaleas resulted in discontinuance of a seventh treatment.

Improvement in scouting trap.--Baffles of the light-weight scouting trap have been modified so that a perforated can with a solid top may be set in the center of the baffle assembly. The porcelain block-bait vaporizer will be enclosed in this perforated can so that the block will not be subject to loss of bait with each rain. This can may be removed from the trap without disassembling. This modification to provide for the bait-block container required an enlargement of the baffle die. The perforated can is small enough to fit into the beetle receptacle of the trap so that it does not affect the nesting of the trap assembly and quantity shipment of the traps in small boxes. Each porcelain bait block is now provided with a hole for part of its length. By using an ordinary oil can, liquid bait may be poured into this hole and the bait quickly renewed while the trap is in operation.

St. Louis control project resumed.--Arrangements were made late in April for resumption of the W. P. A. trapping-treating program in St. Louis, Mo. As soon as preliminary arrangements have been made a small crew will start setting traps in areas known to be infested. The traps will not be baited until early in June, when beetle emergence may be expected.

Larvae in root cavity.--Another instance emphasizing the importance of inspecting soil-free nursery stock for Japanese beetle larvae was disclosed by the removal of a larva from a small Japanese iris root inspected at Glassboro, N. J., prior to shipment from the regulated area.

Gypsy moth certification refused on stock from infested nurseries.--During the month (April) it was necessary to refuse gypsy moth certification on stock dug in a number of New England nursery units. Federal gypsy moth inspection and certification are conditioned on presentation of a valid State certificate stating that the nursery has been inspected by a State inspector and certifying that it is apparently free from moth infestation. The regulations also provide that whenever an appreciable infestation of the moth is determined by a Federal inspector on his examination of material offered for shipment, further certification for interstate movement from such nursery or independent unit thereof will be refused until such nursery has been freed from infestation and has been again inspected and certified by the State to be apparently clean.

Dutch elm disease eradication activities.--With the addition of 44 confirmations during the month, the number of Dutch elm disease cases to date increased to 21,932. During April sanitation crews removed 11,886 dead and dying elms. Crews working in areas to be made elm free destroyed an additional 167,159 trees. Chemical-treating crews also working in clear-cutting areas treated with copper sulphate bands a total of 41,127 elms. The W. P. A. personnel in New Jersey was increased by the addition of 940 laborers. W. P. A. men in the field at the end of the month numbered approximately 3,000. Total trees removed to date in clear cutting, eradication, and sanitation activities passed the 3,000,000 mark in April.

W. P. A. personnel losses continue.--Continued losses of W. P. A. laborers of the better type and their replacement with inexperienced help has affected the efficiency of the eradication work in some sections. Many of the men in the Connecticut and New York areas are leaving this project to accept private employment. Many men left following their reduction from the rate of skilled laborer to that of intermediate laborer. Considerable difficulty is being experienced in obtaining sufficient replacements in Connecticut to maintain the scheduled quota of workers. In the latter State 69 of the 290 laborers terminated their services between April 1 and 15. A number of nonrelief laborers were released on April 15 to reduce to 5 per cent the proportion of nonrelief workers on the payrolls.

FOREST INSECT INVESTIGATIONS

Food-plant preference of European spruce sawfly.--H. J. MacAloney, of the New Haven, Conn., laboratory, reports: "The laboratory work on the European spruce sawfly, carried on throughout the winter in a controlled room, was concluded at the end of April. However, the cages containing females and larvae will be continued in an office room in order to keep the generations active. As stated in an earlier report, it is evident that white, Colorado blue, and Koster's blue spruces are more favorable for oviposition than the Norway, red, and black spruces. There was a heavy mortality in the first two larval instars, often as high as 75 percent, on all hosts, but after the second instar the larvae developed more rapidly on vigorous twigs of white spruce and blue spruce. Adults issued from cocoons placed in vials, where there was a minimum of moisture, earlier than from cocoons placed in bottles with moist peat."

Parasitization of forest tent caterpillar.--P. B. Dowden and P. A. Berry, New Haven, report that 236 egg clusters of Malacosoma disstria Hbn., collected from various points in New England last fall, were held under controlled temperature and humidity conditions during March and April for information regarding hatch and parasitization. The results are shown in the following table. The figures on percentage of hatch were obtained by counting all the eggs in five clusters from each lot and by using the average number of eggs per cluster to compute the total for the separate lots. Percentages are based on total emergence of larvae and parasites.

Liberation point	Parasites							
	Egg	Eggs	Hatch	Para- siti- zation	Ooencyr- tus cli- siocampae	Telenomus: clisio- campae	Tetras- tichus sp.	Ablerus clisio- campae
	masses:	hatched:			Number	Number	Number	Number
	Number	Number	Percent	Percent	Number	Number	Number	Number
Vermont:								
Bennington---	25	2,901	80	6.0	88	26	--	74
Bridport----	25	2,134	62	7.1	129	11	13	22
Bristol-----	25	2,025	66	8.7	170	17	4	3
Danby-----	25	1,598	71	14.1	237	3	4	17
Pawlet-----	25	2,001	82	12.7	247	15	2	29
Randolph----	25	2,100	81	9.0	155	15	35	3
Richmond----	10	579	55	9.6	58	--	2	2
Rutland-----	25	1,698	68	9.9	139	46	3	-
Springfield--	25	2,145	62	11.0	85	13	1	168
Massachusetts:								
Williamstown:	26	1,909	73	10.0	119	20	--	73

Mortality of hag moth.--Messrs. Dowden and Berry also report on parasitization and mortality of cocoons of Cnidocampa flavescens Walk. as follows: "Collections of overwintering cocoons of the oriental hag moth (C. flavescens) were made at observation points in Massachusetts in the vicinity of Boston. The cocoons were all dissected. Records on mortality and parasitization are shown in the following table.

Locality	Moth larvae		Larvae of		Parasiti- zation
	Living:	Dead	Chaetexorista	javana	
	Number	Number	Number	Number	
	Number	Number	Number	Number	Percent
Dorchester (Columbia Road)-----	35	4	6	--	17.0
Dorchester (Boston St.)-----	172	2	13	5	7.0
Cambridge-----	112	-	1	--	0.8
Everett-----	57	4	14	--	24.0
Beachmont-----	163	2	20	--	12.0
Winthrop-----	160	4	18	--	11.0
Revere Beach (Florence St.)-----	125	8	38	--	30.0
Chelsea-----	140	--	29	--	20.0
Nahant-----	8	--	1	--	12.0
Medford-----	144	8	13	--	9.0
Swampscott-----	3	--	3	--	100.0
Revere-----	110	4	--	--	0.

"The results of this survey are particularly interesting, for low temperatures during the winters of 1933-34 and 1934-35 killed off practically all of the imported parasite Chaetexorista javana B. and B. A collection made in April 1935 of 464 cocoons produced only 3 living and 5 dead Chaetexorista larvae. The collections of 1937 indicate that the parasite is building

up rapidly again at a number of points. Under suitable conditions the parasitization should increase to the high percentages prior to 1934. The scarcity of the host at several of the points can hardly be attributed to the low temperatures, as mortality of overwintering moth larvae from the collections made in April 1935 was only 10 percent."

Insecticides for gypsy moth.--S. F. Potts, New Haven, submits the following from a report: "The gypsy moth can be controlled by a spray containing from 5 to 8 pounds of derris (4 percent rotenone) per 100 gallons of water. When from 0.5 to 1.0 gallon of fish oil or linseed oil per 100 gallons of spray mixture is added the period of effectiveness of the derris was greatly prolonged and its adherence increased. Pyrethrum at a concentration of 3 pounds per 100 gallons of water was very effective against the small larvae and is promising as a measure of control of young larvae before they are dispersed by the wind. It is not very effective against large larvae. A thorough application should be made as soon as the eggs have hatched. Nicotine sulphate and nicotine tannate were not effective. Nicotine sulphate 1-1,000, however, when mixed with pyrethrum, increased the effectiveness of the latter by causing the young larvae to become active, spin down, and crawl over the sprayed surfaces."

Effect of low temperatures on Black Hills beetle larvae.--Recent low-temperature tests by N. D. Wygant, of the Fort Collins, Colo., laboratory, with larvae of Dendroctonus ponderosae Hopk., revealed that many of the larvae not killed by exposure to very low temperatures in a low-temperature cabinet are injured by the cold and are not able to complete development. Samples of 100 larvae each were exposed for 2 hours and 15 minutes at intervals of 2.5° F. over the critical range. Fifty exposed larvae were put in separate vials 9 by 33 mm, with pine phloem for food. The other 50 were left in paraffin cells in petri dishes for activity counts at 24-hour intervals. One test made on March 17 with larvae taken from ponderosa pine and exposed at -32.5° will illustrate the results: 58 percent of the larvae in the petri dishes showed activity after being placed at room temperature, but only 2 percent of the larvae in the vials with phloem were able to develop into adults. At that temperature all of the larvae were frozen solid when taken out of the cabinet. Apparently the freezing injured certain insect organs. Some of the survivors of the low temperatures were living at the end of 4 weeks but their action was feeble and abnormal and they were unable to feed on the phloem. A few of the abnormal individuals developed into puny adults without feeding. Although the feeding tests used to separate the abnormal larvae from the normal ones after exposure to low temperatures require additional work, the feeding test may prove to be the only accurate method of determining mortality.

Outbreak of Black Hills beetle on Roosevelt National Forest.--J. A. Beal, Fort Collins, reports that between the years 1923 and 1930 an outbreak of the Black Hills beetle occurred on the Roosevelt National Forest in Colorado and killed an estimated total of 100,000 ponderosa pine trees. Control operations on this forest from 1927 to 1930 successfully terminated this serious outbreak. From 1930 to 1935 the forest remained relatively free from infestation by this beetle but a general reconnaissance made in the winter of 1936 revealed the threat of another serious and widespread infestation.

Scattered groups of infested trees were found which had increased rapidly in number during the last season or two. Infestation was heaviest in the Elk Park, Estes Park, and Boulder districts, the same general country covered by the control work from 1927 to 1930. A general check-up on the number of infested trees indicated that about 8,000 required treatment before the summer of 1937. Approximately two-thirds of this number have been treated to date and control operations are planned so that all infested areas will be covered by the middle of June 1937. Following this work a general inspection of the areas will be made and the need for a later survey determined.

Phyllophaga luctuosa Horn, a 2-year form.--According to H. R. Johnston, of the Georgetown, S. C., laboratory, recent emergence of aged adults determines that the chafer P. luctuosa has a 2-year cycle in South Carolina. This is one of the two most injurious species of May beetles in the Southeast and causes extensive damage to coniferous seedlings in forest nurseries. It has a wide variety of hosts including deciduous stock, but is found principally in the adult stage feeding in pines and oaks. It flies from late in March or early in April to the first of September. P. prununculina Burm. is the other species of considerable economic importance. It appears toward the end of the flight period of P. luctuosa and continues until activity for the season ceases. Mr. Johnston's detailed rearing record is as follows: In the spring of 1935 a 5 by 15 foot plot was freed of grubs and screened above and below ground to prevent natural infestation by chafers. On June 12, 1935, adult P. luctuosa were introduced and allowed to deposit their eggs. The larvae developed to the second or third instar by the end of the summer and by the end of the following summer (1936) all had reached full growth. Adults emerged on the night of April 22, 1937, indicating a 2-year cycle for this species. Also at this time, the first adults of the season were taken in the open.

Dutch elm disease vector studies.--R. T. Webber, of the Morristown, N. J., laboratory, has submitted a report covering experiments which he conducted with the elm borer (Saperda tridentata Oliv.) in 1936. Adults that had been sprayed with a spore suspension of the Dutch elm disease fungus (Ceratostomella ulmi), as well as adults that had either issued from or been confined with material infected with the fungus, were placed in cages with small noninfected trees and logs. Totals of 156 trees, 100 logs, and approximately 3,000 beetles were used in the experiments. The Division of Forest Pathology, of the Bureau of Plant Industry, cooperated by supplying the spore suspensions and by examining the trees and culturing the numerous samples cut from the trees and logs at the conclusion of the experiments. The beetles fed principally on the leaves of the small trees. They first attacked the midribs and frequently the petioles. Both were often nearly severed. Later the beetles fed on the interveinal tissue. The bark of the young growth was also fed upon, although rarely to the extent that the sapwood was contacted. When ovipositing in the logs the female beetle was noted to seek a crevice in the outer bark where she made an incision with her mandibles. She then reversed her position and inserted her ovipositor in the incision, eventually contacting the inner bark where the egg was deposited. Most of the eggs were deposited just within the inner bark but occasionally some were more deeply embedded and rarely were adjacent to the

sapwood. Mr. Webber thinks the results from the young trees are surprising, because beetles that had been sprayed with a spore suspension of the fungus fed so extensively on the midribs, petioles, and bark of the young growth. It would seem that failure to obtain infection was due to the fact that conditions at points where such feeding occurred were not suitable for the development of the fungus. Mr. Webber further remarks that the results may be indicative of the slight importance of Saperda tridentata as a transmitter of C. ulmi.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Spraying supplies distributed.--The complete order of arsenate of lead, fish oil, hose, and couplings has been received at the main storehouse in Greenfield, Mass., and is being distributed to different points in the field in preparation for the start of the spraying season. Barbed wire for fencing in areas that are to be sprayed and from which livestock must be excluded is being distributed, and the fences are being erected. Thousands of yards of burlap, in 8-inch strips, used in banding trees in infested localities to trap the gypsy moth caterpillars, has been sent to various points.

Field meeting at Greenfield demonstrates silvicultural and gypsy moth work.--A meeting was held on April 14 at the C. C. C. camp at Greenfield, Mass., of superintendents of gypsy moth camps, some of the C. C. C. gypsy moth foremen, regular employees engaged in gypsy moth work, and other foresters and entomologists. Talks were given and a visit was made to some of the surrounding area, where a demonstration of silvicultural and gypsy moth work was observed. It is proposed to hold similar meetings later in the year.

Gypsy moth caterpillars beginning to emerge in western Massachusetts.--Young caterpillars were found on four egg clusters in Hatfield on April 20 and 21. This early hatching record is probably due to the location of the egg clusters. General hatching has not yet occurred. Conversely, the foliage in the Pennsylvania area seems to be slightly less developed than last year.

Part of heavy infestation in Hatfield, Mass., reserved for spraying.--A large woodland area in the town of Hatfield has been found to be heavily infested with gypsy moth egg clusters. As this infestation was found too late in the season to complete creosoting operations, about 80 acres have been reserved for spraying.

Many egg clusters found on junk iron.--W. P. A. workers engaged in creosoting work in a heavily infested area in Greenfield, Mass., found approximately 50 gypsy moth egg clusters in the upholstery, on the fenders, and under the dash of an old automobile discarded in a dump. Discoveries of this nature are not uncommon, and emphasize the necessity of inspecting junk materials before movement to points outside of the quarantined area is permitted.

Benefits of selective thinning reduced by careless logging operations.--Logging operations and the cutting of wood for fuel was carried on in two areas in Massachusetts that had been selectively thinned by W. P. A. gypsy moth crews. No attempt had been made to dispose of the branches and treetops, and it will probably be necessary for the workers of this activity to dispose of the debris in order that the stand of trees may receive the benefit of the original thinning work.

Lack of ice on Lake Champlain delays scouting of islands for gypsy moth.--No attempt was made to examine the tree growth on numerous small islands near the Vermont shore of Lake Champlain when scouting work was done in that vicinity last fall, because the examination of these islands could be done more economically during the winter months, when the lake was frozen. On account of the abnormally mild winter Lake Champlain at no time has been covered with ice thick enough to permit safe crossing to the islands. They cannot now be scouted until the lake is free from ice, so they can be reached by boat. It is the first winter since the barrier zone was established in 1923 that safe crossing of the lake on the ice was not possible for several weeks.

Hundreds of spraying permits obtained in Pittston, Pa.--More than 2,500 permits to spray in the residential areas of Pittston had been obtained up to April 24. In obtaining these permits it is necessary to contact each owner or tenant of property where spraying is needed and secure permission in writing to do the work. When a property owner or tenant refuses to give permission in writing to do the spraying where needed, his or her name and address is furnished to a representative of the Pennsylvania Department of agriculture stationed at Wilkes-Barre, who sees that the treatment work is done under the authority of the State law.

New infestation found in Chestnut Hill, Pa.--An infestation of more than 150 gypsy moth egg clusters, covering an area of approximately $3/4$ acre, was discovered in Chestnut Hill Township, Monroe County. Chestnut Hill is south of Tunkhannock Township and is just outside of the gypsy moth quarantined area. The infestation was found in woodland growth, the bulk of which was considered unfavorable for the development of the gypsy moth. The trees were from 6 to 24 inches in diameter, measured breast-high, and consisted of approximately 46 percent maple, 30 percent oak, 6 percent yellow and black birch, 6 percent white pine, 4 percent tupelo, 3 percent ash, and 5 percent of a mixture of hemlock, shadbush, and black cherry.

Railroad tracks patrolled in mountainous sections of Pennsylvania.--While scouting tree growth for gypsy moth egg clusters in mountainous, ledgy country along railroad trunk lines in Pennsylvania, it has been necessary to detail one man from each crew to patrol the right-of-way and remove the numerous large rocks dislodged by the scouts. The type of country is such that it is impossible to do the work thoroughly without dislocating rocks, and the patrol is essential to prevent accidents.

Beavers handicap gypsy moth work.--Large dams have been built by beavers in many of the streams in Penn Forest and Kidder Townships in Pennsylvania, and hundreds of acres of timber land have been flooded. Much difficulty has been experienced in scouting the trees that have not yet been killed in the more recently flooded areas. The water did not freeze sufficiently during the winter to enable the workers to walk safely on the ice, and in most instances the water has been so deep that they could not examine the trees with boots. These animals, once practically extinct in this section of the country, have now become so numerous in certain areas that State game wardens have found it necessary to trap them and move them to other sections where new colonies may develop. This procedure minimizes the damage that may be done by the beavers in any particular locality.

Dangerous scouting near surface coal mines.--Much difficulty has been experienced in examining sections in the Pennsylvania area where surface mine stripping has been done. In such areas the earth has been removed, and the coal obtained by means of large scoop shovels, leaving holes 150 to 200 feet deep and 1/4 mile or more in length. Examination of the tree growth, consisting chiefly of oak, on the edge of the mine stripping is very hazardous.

Two gypsy moth scouts extricated from quicksand.--While scouting a large swampy area in Madison Township, Pa., two of the men sank to their waists in quicksand. They were extricated with difficulty by other members of the crew and taken to solid ground. Because of the danger that more serious accidents might result from work in the quicksand area, scouting was discontinued there for the present. It will probably be necessary to examine this swamp area in the winter when it is frozen sufficiently to bear the weight of the scouts.

Burlap distributed to C. C. C. camps; personnel reduced.--Burlap is being distributed to the C. C. C. camps for use in banding trees during the summer. The more or less continual changes in men allotted to gypsy moth work and the reduction in personnel that appears imminent in all of the States may prevent the completion of the program. It has been learned that the camps in Connecticut where gypsy moth work is being done under the supervision of this Bureau will be reduced in membership from an average of from 300 to 400 to a maximum of 140 men. This will materially reduce the amount of work that can be done in that State.

Gypsy moth work started at new camp.--A crew of 20 men from the C. C. C. camp in Shrewsbury, Vt., has started gypsy moth work. The work at this camp will be nearer the barrier zone than that of the other Vermont camps. Exhibition material has been supplied to two camps in Vermont to be used at sportsman's shows in Bellows Falls and Brattleboro.

Brown-tail moth work.--In Maine scouting for brown-tail moth winter webs has been practically completed within the area under quarantine, except for a number of towns located on islands along the coast. Some crews are now scouting in a number of towns outside the quarantine line and two

additional towns in Washington County have been found to be infested. Numerous webs are still being cut in New Hampshire but none have yet been discovered in Connecticut. Scouting work has been completed in most of the towns in Massachusetts. Scouting for brown-tail webs at two sites in Rhode Island, which were found to be infested last year, has been completed. Winter webs were found at both locations, but the infestations were much lighter than last year. A total of 44 webs were cut at the two sites, while more than 300 were found there last year.

PLANT DISEASE CONTROL

First stem rust infection on barberry bushes observed April 19.--The first stem rust infection on barberries in the barberry-eradication area was reported from West Virginia on April 19. Since then pycnia have been reported on Berberis canadensis in West Virginia, and the first infection on barberries at the Foreign Plant Introduction Garden, Bell, Md., was observed on April 29. Aecia were observed on barberries in Wythe County, Va., on May 3. Pycnia were reported to be developing rapidly on barberry bushes in Minnesota on May 5.

Barberry eradication in Ohio.--According to Harry Atwood, State leader in charge of barberry eradication in Ohio, a total of 366,238 barberry bushes have been destroyed on 2,093 different properties in 42 counties in Ohio, since control work was undertaken with emergency funds in August 1935. During this period an average of 256 men were employed at an average man-year cost, based on total obligations, of \$796.42. Mr. Atwood reports that conditions were favorable for field work throughout last winter. Many heavily wooded areas were surveyed and inspections were made in many of the larger cities. In checking winter work he finds that the salt treatment is just as effective during the winter months, when the ground is frozen, as during other seasons of the year.

Barberry eradication in Indiana.--Escaped barberries were discovered in Indiana early in the barberry eradication campaign and each year since new areas have been discovered in various parts of the State. In 1926 only about 60 known areas of escaped barberries had been found. From these areas, 103,863 bushes have been removed on 341 properties. To date, 152 such areas of escaped bushes have been found and 23 of these were found during the calendar year 1936. A total of 133,571 escaped barberries have been destroyed on 951 properties. During 1936, a total of 13,454 escaped barberry bushes were destroyed on 108 properties. These areas of escaped barberries were located in 69 counties and were distributed over the State in such a way that, unless kept under control, the bushes might be expected to eventually spread to every square mile in the State. To keep an area of escaped barberry bushes under control requires inspection at intervals frequent enough to prevent seedling bushes from growing into fruiting bushes. As a rule this inspection should be once in every 5 or 6 years until bushes are no longer found. In areas where only a few fruiting bushes have been found, two or three surveys will usually clean up the area. However, where several thousand fruiting bushes have been growing in an area for 25 to 50

years, the problem is more difficult. It may be necessary to inspect such areas at regular intervals for many years. Definite progress is being made in cleaning up areas of escaped barberries in Indiana, as evidenced by the fact that no bushes were found in 39 of the 152 escaped areas when the last survey of the area was made.

Pine-infection surveys.--Pine-infection surveys have been carried on recently in the North Central region in the St. Paul district of Minnesota and in Upper Michigan. In these surveys pines were examined for blister rust cankers and were recorded as not infected, infected, or too large to inspect. Data were also obtained on the number of cankers by probable years of origin. In Minnesota, during the month of April, 978 pines were examined by a two-man crew. The percentage of infected trees found was 5.32. In the three Michigan Counties of Dickinson, Menominee, and Marquette, five plots were laid out in protected areas and five in unprotected areas. The protected areas showed 5.6 percent of the trees infected, of which 97.4 percent were clearly infected prior to 1934 when Ribes eradication was performed. The five plots established in unprotected areas showed an average of 35 percent of the trees infected. The majority of cankers found were on wood of 1933-35 growth.

Phenological data on blister rust.--L. W. Hodgkins reports that several fruiting blister rust cankers were observed in Massachusetts during the early part of April. One canker was found fruiting on March 28, which is very early for this region. In Virginia aecia were found just protruding through the bark of white pine on March 25. Cultivated gooseberries were reported to be leafing out in Franklin County, in southern Virginia, on February 19. A report from Michigan states that Ribes leaves were starting on plants along the lake shore on May 1, but farther inland the leaves had not yet appeared nor had the blister rust cankers reached the fruiting stage.

Spread of blister rust.--Blister rust infection on pine has been reported for the first time in Monroe and Sauk Counties, Wis. In Monroe County one blister rust canker was discovered on April 12, and in Sauk County three cankers were located on April 13. This is the first time blister rust has been found in Monroe County, either on pine or Ribes, whereas in Sauk County infection on Ribes had been previously reported.

COTTON INSECT INVESTIGATIONS

Boll weevil control on Sea Island cotton in Florida and Georgia.--Investigations are being started this season designed to develop measures for the control of the boll weevil on Sea Island cotton. Practically no work of this kind has previously been done, because the former extensive plantings of Sea Island cotton disappeared with the advent of the boll weevil. During the past 2 years extensive plantings of Sea Island cotton have been made in Florida and Georgia. Sea Island cotton (Gossypium barbadense L.) and the upland varieties of Gossypium hirsutum L. are distinct species and because of the soft boll walls, late maturity, and dense foliage of the Sea Island

cotton, it appears that the boll weevil will be more difficult to control on it than on the upland cotton. Investigations for the 1937 season are underway in southern Georgia in cooperation with the Georgia Coastal Plains Experiment Station at Tifton; in eastern Georgia along the Atlantic coast, in cooperation with the State Entomologist of Georgia; and in Florida, in the vicinity of Gainesville, in cooperation with the Florida Agricultural Experiment Station.

A new root weevil situation in Florida.--On May 14, 1937, J. R. Watson, of the Florida Experiment Station, and U. C. Loftin, Washington, D. C., made a brief survey of the area infested by Naupactus leucoloma Boh. in western Florida. Mr. Loftin reports that only a limited area appears to be infested. This is located in the northeastern corner of Okaloosa County and northwestern corner of Walton County in Florida and along the southern border of Covington County, Ala. The infested area seems to center around Svea. Svea is about 20 miles north of Crestview, Fla., and is between Laurel Hills, Fla., and Florala, Ala. The area infested is a typical scrub oak, wiregrass country with poor sandy soil. Apparently it is confined within a radius of 5 miles of Svea. It has apparently been present for several years, as a number of farmers were acquainted with it. The local name is "pender worm", or cotton "billbug." The damage is caused by the larvae feeding on the roots of the plants. The lower part of the stem and taproot are chewed away, but no damage was noted on the smaller lateral roots. Peanuts, cotton, corn, and velvetbeans were the only plants found infested, though limited examinations were made of miscellaneous vegetation growing on the ditch banks, and of cowpeas, turnips, and collards. In cotton the epidermis and usually about half of the woody stalk was eaten from 1 to 5 inches below the soil surface. The feeding areas were an inch or more in length and only occasionally was the stem or root completely severed, as in cutworm injury. On corn a round hole from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter is cut into the main stem, resembling the work of the corn billbug, but considerably larger in diameter. The holes seldom penetrate more than midway of the stalk. On the stems of seedling peanuts, which are larger and fleshier than cotton or corn, the feeding areas were shallower and were typically a general gnawing of the epidermis. Only a few small velvetbean plants were observed and the damage to them was more like that on cotton. All of the damaged plants observed were only a few inches tall. Most of the larvae found were rather uniform in size--about $\frac{1}{2}$ inch long--and a few were apparently preparing to form cells and pupate. A few smaller larvae, about two-thirds the size of the larger ones, were taken. In most cases the larvae were within a radius of 2 or 3 inches of the plants but in some places where the plants had been killed, the larvae were several feet from them. The infested plants turn yellow, wilt, and die. A part of a large field of cotton on the farm of J. Duff Reeves, containing from 75 to 80 acres, was examined, where the stand had been seriously damaged. The cotton had been chopped and plowed and skips of three or four plants were common. In some rows all of the plants had been destroyed for 30 to 50 feet and in general 20 or 25 percent of the plants were destroyed in the part seen, which was the most damaged. As many as five or six larvae were found around one cotton plant, and two or three per plant were quite common. This part of the field had been planted to peanuts last year and the county agent reported that crops following peanuts were damaged more than when planted after other crops. A few volunteer peanuts were

growing in this cotton and there did not seem to be any particular preference for this plant. A field of several acres of corn following peanuts last year on the farm of M. S. Johnson was also badly damaged. In the only field of peanuts examined the plants were quite small. They were planted on land that was in peanuts last year and were not heavily damaged. The county agent stated that the peanuts were all killed last year on at least an acre of this field, but that hogs had been pastured on it until March of this year. We could not find any grubs under the peanuts, although they were fairly abundant in the other part of the field, planted to corn. Apparently the hogs had eaten the overwintering insects or rooting and moving the soil had caused them to die. Adults appeared about the first of July last year and were seen only a short time, so there is apparently only one generation a year. The county agent reported the weevils were taken on the leaves of cotton and peanuts where they appeared to be feeding to some extent. The winter is probably passed as eggs or small larvae in the soil. The first report of the appearance of this weevil in this county was made by the Division of Insect Identification in the Bureau News Letter dated September 1, 1936, when it was reported that L. L. Buchanan had identified as N. leucoloma Boh. two specimens received from A. N. Tissot, of the Florida Agricultural Experiment Station. These weevils came from this area near Crestview, Fla., and at that time were reported to be injuring peanuts. In the October 1, 1936, Insect Pest Survey Bulletin J. R. Watson reported this insect had appeared during the summer in the northern part of Walton County, Fla., and in adjacent areas in Alabama, where it was causing much damage to peanuts and some injury to cotton and other plants.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Wild-cotton eradication.--The eradication of wild cotton in southern Florida has continued to make excellent progress. During April the crews were at peak size and at least as much work was done as during any single month since this activity has been under way. A small virgin colony of cotton was located and removed in Hillsborough County and another in Pinellas County, on the west coast. With the exception of one virgin plant found in 1936, these were the first virgin plants found in either of these two counties in 2 years. The missing of the colonies is due to the fact that the area had been burned over a number of times and crews had to come along at just the right time in order to locate the cotton. The program on Cape Sable has practically been completed for the season. A large portion of this area has been recleaned twice since December. The only portions not recleaned a second time were those worked late enough in the season so that seedlings have not yet begun to grow. The eradication work is undoubtedly in the best condition it has ever been. The pink bollworm infestation in wild cotton in southern Florida was first discovered in June 1932 and since that time a number of surveys have been made by truck and boat in an effort to locate all of the wild cotton. There was a large area that had never been covered because it could not be gotten into by walking nor reached by boat. It is principally the section known as the Everglades. An autogiro

owned by the Dutch elm disease project was loaned to this project and arrived in Miami on March 19. This plane was used to make a survey of the section that had never been covered before. In covering the area all high ground known as hammocks and shell mounds, which might be capable of sustaining wild cotton growth, was charted on a map. Approximately 1,900 square miles were covered with the autogiro and 24 new hammocks and shell mounds that might contain wild cotton were located. It will be a fairly simple matter now to reach these points to see whether or not they contain cotton. Of equal importance is the fact that many hundred square miles can now be eliminated from any further consideration with respect to the wild cotton program. Various inspectors of the project served as observers during the flights. In addition to locating the new points where cotton might occur and eliminating a large area, the inspectors who served as observers have gained a much better knowledge of the area in which they are working. It has been estimated that the cost of the surveys made by truck and boat was approximately \$17.50 per square mile, whereas the cost of the survey with the autogiro was approximately 44 cents per square mile.

Thurberia-plant eradication.--Satisfactory progress has been made with the eradication of *Thurberia* plants in the Santa Catalina Mountains of southern Arizona. During the month 1,240 acres were covered and 14,147 *Thurberia* plants were destroyed. This makes a total of 100,505 acres that have been covered and 1,110,003 *Thurberia* plants that have been destroyed. Toward the end of the month all of the area readily accessible from the camp in Sabino Canyon had been covered; therefore a new camp site was located in Romero Canyon about 8 miles westward, and the camp was moved to that point. Several hundred acres have already been worked from the new camp without finding any plants. This acreage, however, was at a higher elevation than any plants have ever been found. It is known that there are numerous *Thurberia* plants in this new area at lower elevations.

Laboratory inspection.--Laboratory inspection is now going forward at San Antonio and most of the field stations. The most interesting phase of this activity was the inspection of green bolls collected last fall in the heavily infested areas. For the past 3 years a sample of 100 green bolls has been collected annually from 20 fields located throughout the cotton-producing section of the two heavily infested areas. An effort was made to select fields that had been planted to cotton each year. One of the fields was not planted to cotton, therefore bolls were collected from the nearest field. When this plan was first inaugurated there was some doubt as to whether or not very small larvae could be found in green bolls after they had been preserved for some time. To obtain definite information on this point, duplicate samples of bolls were collected the first year. One set of samples was inspected immediately after the bolls were collected and the other was preserved and inspected several months later. The results were practically the same in each case, thus establishing the fact that specimens could be found as easily in preserved bolls as in fresh bolls. In Brewster and Presidio Counties, known as the Big Bend of Texas, the results of the 1936 crop inspections show that there are 9 fields which contain a larger number of worms per acre than in 1935, and 11 which contain a smaller number. In Brewster County the number of worms per acre was heavier than during the two

preceding years. This is perhaps accounted for by the fact that a small field of cotton was planted very early in the spring of 1936 and served to breed up large numbers of worms to infest the bulk of the crop, which was planted later. In Presidio County the number of worms per acre was less than in the previous year, although the general impression was that actual damage by the pink bollworm was heavier. During August 1936 there was considerable rain and cloudy weather and possibly this condition led to the decay of a large number of bolls as a result of moisture getting into them by exit holes made by the pink bollworm. Thus there could have been more damage as a result of the peculiar weather conditions, even though the actual number of worms present was smaller. In the heavily infested part of Hudspeth County, Tex., the inspections indicate that infestation seems to be building up. There were 14 fields in which the number of worms per acre was higher than in the preceding year, 3 fields in which the number was less, and 3 fields in which no infestation was found.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Nicotine-peat moss dust mixture not effective against common species of cabbage worms in Louisiana.--C. E. Smith, of the Baton Rouge, La., laboratory, reports that in field experiments involving several species of cabbage worms (principally Autographa brassicae Riley, Hellula undalis Fab., and Ascia rapae L.), a dust mixture of peat moss containing 2 percent nicotine was distinctly inferior in insecticidal efficiency to derris dust mixtures containing 0.5 and 1.0 percent rotenone, as well as to an undiluted tri-calcium arsenate. There was practically no difference between the efficiency of the derris dust containing 0.5 percent rotenone and that of tri-calcium arsenate, but a derris dust mixture containing 1.0 percent rotenone was distinctly superior to the other three materials tested, when applied at intervals of 2 weeks.

Disease reduces mole cricket population in Florida.--J. N. Tenhet, of the Sanford, Fla., laboratory, reports that the abundance of mole crickets (Scapteriscus spp.) is being reduced in the Sanford district, apparently by a disease. The decrease was noted during the fall of 1936, but it was not until March 1937 that the cause became apparent. The causal agent has been determined by Vera K. Charles, of the Bureau of Plant Industry, as probably Sorospora uvella, which is either closely related to or identical with the organism that attacks the corn earworm.

Tolerance of narcissus forcing bulbs to thermal treatments.--Observations at the Babylon, N. Y., laboratory, by Randall Latta and F. S. Blanton on the flowering of narcissus bulbs which had been subjected to vapor-heat or hot-water treatments during August, September, and October 1936 for the control of the bulb nematode (Ditylenchus dipsaci (Kuhn) Filipjev) and other bulb pests disclosed the following information: (1) Bulbs treated in vapor heat for 6 and 8 hours at 110° F.; for 6 and 8 hours at 112°; for 4 and 6 hours at 114°; for 4, 6, and 8 hours at 116°; and for 4, 6, and 8 hours at 118°, following a 2-hour presoaking at 70° to 80°, all failed to produce normal crops of flowers when forced. (2) Results were similar with bulbs

treated in hot water for 4, 6, and 10 hours at 110°; for 3, 4, and 5 hours at 112°; for 3, 4, and 5 hours at 114°; and for 4 and 6 hours at 116°, following a 2-hour presoaking at 70° to 80°. (3) All but 14 of the tests resulted in serious reduction of the number of flowers produced, and all had at least 50 percent of the flowers injured. (4) The bulbs were more tolerant to preheating than to presoaking. (5) Formalin added to the treating water in hot-water treatments was slightly detrimental, but showed no injurious effect when added to presoaking water in vapor-heat treatments. (6) The varieties Emperor, Tresserve, Spring Glory, Glory of Sassenheim, Golden Spur, Glory of Lisse, and Laurens Koster all proved to be more tolerant to thermal treatments than was King Alfred. (7) Midseason treatments were tolerated better than late-season treatments. Samples of hyacinths, tulips, and bulbous iris all failed to bloom and in many tests failed to grow when given thermal treatments late in the season.

Role of insects in disseminating azalea flower spot.--Observations and experiments during January, February, and March, at Charleston, S. C., by F. F. Smith and R. H. Nelson, of the Beltsville, Md., laboratory, involving 1,600 inoculation tests, indicated that insects do not bring the organism causing the azalea flower spot disease into gardens or nurseries to cause infection on the flowers appearing early. The appearance of the earliest infections on flowers close to the ground indicated that the soil or mulch may be the hold-over source between flowering seasons. It was found that with the increase in the number of insects that visit the azalea flowers, notably the bees Bombus spp., Xylocopa spp., and Emphoropsis floridana Smith, a decided increase occurred in the general spread of the disease on all parts of azalea plants. The percentage of infective insects increased in collections as the disease became more prevalent, one adult of Xylocopa virginica (Dru.) causing 19 infections in one test. Evidence was obtained that insects carried azalea flower spot infection to a nursery 1 mile distant from the nearest azalea planting. An adult of Bombus bimaculatus Cress., bearing paint applied to bees visiting azalea flowers in one garden, was captured 8 days later in another garden 5 miles distant. The disease was transmitted experimentally by means of insects to wild azalea (Azalea nudiflora L.) but not to huckleberry (Vaccinium). In transmission tests, comparing the infections on untreated flowers and on flowers dusted previously with a fungicidal dust containing 20 percent monohydrated copper sulphate, a reduction of 45.4 percent was obtained in the number of bees causing infection and a reduction of 64.4 percent in the number of infections on the dusted flowers, as compared to the undusted ones.

Vacuum fumigation of cigarette beetle larvae with ethylene oxide-carbon dioxide mixture.--According to data obtained by E. M. Livingstone and W. D. Reed, of the Richmond, Va., laboratory, it appears that a commercially prepared ethylene oxide-carbon dioxide mixture cannot be used successfully for the fumigation, under partial vacuum, of tobacco bales infested by larvae of the cigarette beetle at winter temperatures. During the latter part of March three experiments were performed with this mixture on Turkish tobacco, using dosages of 60.8 pounds and 91.0 pounds, respectively, per 1,000 cubic feet. At the end of 4 hours, approximately 50 percent of the test

insects placed within the bales were killed and at the end of 24 hours the mortality ranged from 83 to 91 percent. No significant difference could be detected between the performance of the two different dosages used. The temperatures within the tobacco bales ranged from 53° to 54° F. A total of 4 experiments were also performed with Puerto Rican cigar filler tobacco, using a dosage of 58.7 pounds of the mixture per 1,000 cubic feet in each test, with an exposure of 4 hours. In these experiments the mortality of Lasioderma serricorne Fab. ranged from 9.6 to 80 percent for the test lots of insects removed from the bales at the expiration of 4 hours, and from 56.8 to 88.8 percent for the insects left in the bales 24 hours after exposure. The temperatures within the tobacco bales during these experiments ranged from 48° to 56° F.

Insects in skunk droppings.--H. C. Mason and B. J. Landis, of the Columbus, Ohio, laboratory, report that an examination of skunk droppings, which measured approximately 1½ inches long by ½ inch wide, collected in a bean field at South Point, Ohio, during June 1935 disclosed the remains of a total of 409 adult insects, including: Epilachna varivestis Muls., 6; Ceratomegilla fuscilabris Muls., 1; Hippodamia convergens Guer., 1; Elateridae, 9; small Coleoptera, 22; Rhynchophora, 1; Carabidae, 3; large Coleoptera, 1; Orthoptera, 1; and small Hymenoptera, principally ants, 364.

Multiple parasitization in hornworm larvae.--On several occasions Mr. Landis has observed that the tachinid parasite Sturmia distincta Wied. issued from the same larva of the hornworm Protoparce sexta Johan, which also produced Apanteles congregatus (Say). Dissection of such larvae, which had been subjected to multiple parasitization, disclosed that S. distincta larvae were present in the alimentary canal of the host, whereas in none of the examples examined was there any evidence that the larvae of A. congregatus had penetrated the alimentary canal. The latter species normally emerges from the host and pupates 2 or 3 weeks earlier than does S. distincta.

INSECTS AFFECTING MAN AND ANIMALS

Seasonal incidence and hosts of the Gulf coast tick.--E. F. Knipling, Valdosta, Ga., reports that no adults of this tick were found on livestock up to the middle of April. Collections of birds during March and April in the vicinity of Raymondville, Tex., indicated considerable activity of the immature stages of this tick. A few larvae were active in March but none were collected in April. Here, as in the Southeastern States, the meadow-lark is an important host of the immature stages of this tick, which were found in abundance on this host until about April 1. After that date a marked decrease in numbers was noted. Other birds found to be infested with immature stages of the Gulf coast tick in the vicinity of Raymondville are cowbird, boat-tail grackle, field sparrow, and plover. As these birds are fairly numerous in the area, they may be important in the development of immature stages of this tick.

Dispersion of the primary screwworm fly.--D. C. Parman, Uvalde, Tex., reports that records on the dispersion of the primary screwworm fly indicate that the northward movement has been equally as fast as that noted last year. This dispersion averaged about 35 miles per week last year. The westward movement seems to have been especially fast this spring, as the fly was present at Balmorhea, Tex., on or before April 26. Failure to find specimens of this species in the Big Bend district up to that date indicates that migration did not reach Balmorhea from the Big Bend.

Build-up of primary screwworm fly in southern Texas.--Mr. Knipling and W. L. Barrett, Jr., report that screwworms were active in southern Texas during the latter part of the winter, the greatest activity apparently occurring in Willacy County and the northern part of Cameron County. The first noticeable increase in activity in this region was reported during the last week in February and continued to increase thereafter. The early high population in this vicinity was evidenced by reports of stockmen and by the large numbers of Cochliomyia americana C. and P. trapped in Willacy County early in March. By the last of April the population apparently was still on the increase and was higher in Willacy County than in any of the other lower Texas counties. In the farming section in the southern part of Hidalgo and Cameron Counties the fly population was apparently low during the first half of March and, at least in Hidalgo County, continued to be low until the latter half of April, when the number of flies trapped showed a definite increase. As might be expected, the fly population did not build up as rapidly in the farming section as in the range country. The records on C. americana abundance, as determined by the operation of meat-baited fly traps, appeared to tally very well with reports of screw-worm attack on livestock in this part of Texas.

Hibernation studies on the primary screwworm fly.--A. L. Brody, Valdosta, Ga., reports that C. americana was able to survive the winter of 1936-37 in outdoor screened cages. Although breeding was slowed down considerably, sufficient breeding occurred throughout the winter to carry the species through at Valdosta, Ga. At this locality C. americana adults developed and emerged within 44 days from larvae dropped on February 13 and 23 on different types of soil and from pupae buried within 2 inches of pasture sod. At Gainesville, Fla., C. americana was also able to survive the winter in outdoor screened cages. The length of each generation was increased, but sufficient breeding occurred throughout the winter to carry the species through without difficulty.

New laboratory for screwworm investigations.--On May 15 a new set-up was established at Menard, Tex., for a more intensive study of the screw-worm problem under typical ranch conditions. This laboratory is located about 2 miles west of Menard. Roy Melvin has been placed in charge. A typical ranch tract of about 1,300 acres has been leased and arrangements have been made to run several hundred head of sheep and goats and a number of cattle on this tract.

Calcium arsenite vs. mosquito larvae.--W. V. King reports on preliminary laboratory experiments with the use of calcium arsenite as a substitute for paris green in destroying *Culex* larvae. One sample tested contained approximately 2.5 percent water-soluble arsenic and the other 8 percent. On the basis of killing time, the latter showed the higher toxicity and was intermediate in this respect between the two best samples of paris green. The other sample showed about the same killing time as the third sample of paris green. While the calcium arsenite has not been prepared commercially, we are advised that it can be manufactured at a much lower cost than paris green. If so, the results of these preliminary tests indicate that it may prove to be a satisfactory substitute for the more expensive material.

Cattle lice controlled by rotenone spray.--R. W. Wells reports promising results in the control of both biting and sucking lice of cattle with the use of a spray consisting of 1/2 g of rotenone in 100 g of carbon tetrachloride. Although much more experimental work is required in this field, the following tentative conclusions may be drawn: (1) It is a rapid and simple method of treatment, and very prompt in its effect on the lice. (2) The eggs are apparently not vulnerable to the treatment as used. (3) Treating a large animal thoroughly will require about 100 cc of the solution and younger animals will require less, down to about 50 cc for the smallest calves. (4) The cost of carbon tetrachloride makes the treatment more costly in materials used per animal than powders of diluted derris or diluted Cracca.

Tests of derris, tephrosia, and sulphur against cattle and horse lice.--H. O. Schroeder draws the following tentative conclusions from a series of tests of these dry insecticides to cattle and horses for the control of lice, the following species being dealt with: *Haematopinus asini* L., *Trichodectes pilosus* Giebel, *H. eurysternus* Nitz., *Linognathus vituli* L., and *T. scalaris* Nitz. (1) A derris-tripoli earth mixture containing 1/8 of 1 percent rotenone is an efficient insecticide in controlling both Anoplura and Mallophaga on cattle and horses. (2) Tephrosia was found to be as effective as derris when the rotenone concentration was the same. (3) From 1 to 4 ounces of dust, depending on the size of the animal, is sufficient to give good coverage. (4) No evidence was found to indicate that the rotenone or sulphur dusts had any effect on the eggs. Thus subsequent applications are necessary to effect complete control. (5) The cost of the derris in a dust with a rotenone content of 1/8 of 1 percent was only 1 1/4 cents per pound. (6) In general, sulphur, as used in these tests, was less efficient than dusts containing rotenone, although in some instances infestations were reduced by as much as four-fifths.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--One hundred and thirty-nine living larvae of the fruit fly *Anastrepha suspensa* (Loew) were collected on October 30, 1936, in fruits of India-almond (*Terminalia catappa*) in the field at Arecibo, P. R. Four living larvae of the pepper weevil (*Anthonomus eugenii*

Cano.) were intercepted at Nogales, Ariz., on March 9 in bell peppers in cargo from Rosales, Sinaloa, Mexico. Living specimens of the mirid Eurycippitia splendens Dist. were taken at Washington, D. C., on December 24, 1936, on orchid (Cattleya sp.) plants in express from Colombia. The soursop chalcid (Bephrata cubensis Ash.) arrived at Miami, Fla., on January 9 in fruit of soursop (Annona muricata) in ship's stores from Jamaica. This eurytomid, which is recorded from Florida, has been intercepted in Annona spp. from Central and South America, Mexico, and the West Indies. A larva of Sericus brunneus L. was found at Chicago, Ill., on December 24, 1936, in a case of Manetti rose stock in cargo from the Netherlands. This elaterid is not recorded from the United States and possibly represents a potential pest. Four living larvae of the West Indian sweetpotato weevil (Euscepes batatae Waterh.) were intercepted at Mobile, Ala., on January 9 in sweetpotato roots in ship's stores from Cuba. Living adults of the weevil Apion pomonae F. arrived at New Orleans on January 14 and 15 in seed and pods of vetch in cargo from France. The vetch was mixed with rye straw used as packing for wine. An adult of Bruchus luteicornis Illiger was taken at Baltimore on September 4, 1936, in a seed of Vicia grandiflora in cargo from Hungary. Palaeopus costicollis Marsh. was found at New York on December 17, 1936, in a yam root in baggage from Jamaica. Concerning the yam weevil, L. L. Buchanan reports that P. dioscoreae Pierce is a synonym of P. costicollis Marshall. One hundred and seventy-seven living larvae of the turnip gall weevil (Ceutorhynchus pleurostigma Marsh.) were intercepted at Philadelphia on February 11 in white turnip roots in ship's stores from England. Fifty-five living larvae of this weevil were taken at the same port on February 12 in rutabaga roots in ship's stores from England.

Pod borer in beans from Mexico.--A living pupa of Maruca testulalis Geyer (?) was taken at Nogales, Ariz., on March 13 in a lima bean pod in cargo from Acaponeta, Nayarit, Mexico. While this is the first record of this insect being intercepted from the West Coast of Mexico, three living larvae of the bean pod borer (M. testulalis Geyer) arrived at Laredo, Tex., on January 15, 1935, in string bean pods in cargo from Cuauhtemoc, Tamaulipas, Mexico.

Philippine orange moth in sour limes.--Living specimens of Prays citri Miller were intercepted at San Pedro, Calif., on February 14, 1937, in sour limes in ship's stores from the Philippines. Out of a lot of 23 sour limes, 6 were found to be infested. This hyponomeutid has also arrived from Greece, Guam, Italy, and Java. In addition to sour lime, it has also been intercepted in grapefruit, lemon, orange, and sweet lime. This insect causes galls by boring into the rind of the fruit and also injures the blossoms of citron (Citrus medica), lemon, and orange.

Pathological interceptions of interest.--Albugo candida (Pers.) O. Kuntze was intercepted at New York on April 1 on radishes from Argentina. Aplanobacter michiganense E. F. S. was intercepted at El Paso on April 7 on tomatoes from Mexico. Other interceptions have been received from Mexican border ports since then. Ascochyta pisi Lib. was intercepted in hairy vetch seed from Czechoslovakia on March 13 and on Vicia faba from Italy on April 1 at New York. Ceratostomella fimbriata (E. and H.) Elliott was intercepted

from Belgium on April 20 at Houston, from Belgium and England on April 22 at Port Arthur, from France on April 22 at Savannah, and from Germany on April 25 at Mobile, all on carrot, indicating that the disease is rather widespread on this host in Europe. Diplodia natalensis Ev. was intercepted on tomato fruit from Mexico on January 21 at Nogales. Gloeosporium sansevieriae Verw. and Dupl. was intercepted on Sansevieria from England on April 8 at New York. The only previous interceptions have been from Bermuda and Puerto Rico. Gloeosporium sp. on pepper from Cuba intercepted on April 16 at Mobile does not fit descriptions of species usually found on this host. Mycosphaerella citrullina (C. O. Smith) Gross. was intercepted on April 10 at Philadelphia on pumpkins from South Africa. Peronospora effusa (Grev.) Ces. was intercepted on spinach from Mexico on March 27 at El Paso and at other border ports later and from Belgium on April 16 at New York. P. valerianae Trial was intercepted for the first time on March 10 on Valerianella locusta var. olitoria from France at New York. Phomopsis sp., no species reported on host, was intercepted on pods of Myroxylon from Trinidad on November 1, 1936, at New York. Puccinia boutelouae (Jennings) Holw. was intercepted for the first time on June 4, 1936, at New York on Bouteloua sp. from Mexico. P. mayorii Ed. Fischer, first interception, was found on Sideritis theezans at New York in mail from Greece on January 11, 1936. Rotylenchus bradys (Steiner and LeHew) Filipjev was intercepted in yam (Dioscorea alata?) from Cuba for the first time on April 16 at Mobile. Morning-glory roots from Japan intercepted April 14 at Philadelphia were found to have minute black sclerotia about 20 μ in diameter scattered all through the tissue and only a few μ apart. Septoria anthrisci Pas. and Brun. was found on leaves of Anthriscus cerefolium from Italy on October 21, 1936, at New York, first interception. Sphaceloma perseae Jenkins was intercepted on avocados from Colombia on April 22 at New York. This appears to be the first report of the disease from Colombia. Vermicularia trichella Fr. was intercepted at New York on January 23 on ivy from Norway.

Spotting of citrus from Mexico.--For 2 or 3 years citrus from Mexico has been intercepted at border ports and forwarded for determination of the cause of the more or less severe spotting that marred the appearance of the fruit. Microscopic examination of these spots failed to reveal any organism and citrus disease specialists of the department were unable to diagnose the trouble. Last fall arrangements were made to turn material of this nature over to Chas. Brooks, of the Bureau of Plant Industry, for study. A request was sent to several border ports to be on the lookout for spotting of citrus fruit from Mexico. Dr. Brooks examined and cultured numerous specimens turned over to him and reports that he has been unable to obtain any organism from the affected spots. It would appear that if this trouble is infectious, as is claimed by some growers, it is probably a virus disease. Dr. Brooks is unable to offer any explanation for the spotting.

Customs inspectress aids plant quarantine inspector.--A passenger from Kingston, Jamaica, was met at the New York pier by her sister, who had obtained a pass beyond the barrier through the courtesy of the Customs. During the inspection of the passenger's baggage the visitor picked up a coat belonging to the passenger and threw it over her arm. She objected violently

to examination of the coat, insisting it was hers. The inspectress involved, having seen her pick up the coat, suggested that rather than have any scene during the baggage inspection she would tip off the guard at the barrier to search the coat. When the visitor went through the gate the Customs guard searched the coat, again under protest, and found three mangoes in the pockets. The plant quarantine inspector was called and he in turn called the Customs Deputy, as the visitor at that time denied ownership of the coat saying she had picked it up in error.

Infested oranges peeled and served.--On February 20 and again on February 23, dipterous larvae, identified as Anastrepha ludens Loew, were taken from fruit collected on the Pan American plane from Mexico City. The circumstances surrounding these interceptions are of more than passing interest. In each case the larvae were taken from oranges which the company places on their planes flying between Mexico City and Brownsville for consumption by the plane's passengers. Before they are put aboard these oranges are peeled and quartered, so that they may be eaten with the minimum amount of effort, a procedure which should preclude the possibility that this fruit would be found infested. However, some was infested and this may be explained by the fact that the Mexican fruit worm, when it infests navel oranges, usually works in the navel section of the fruit, the only part of the fruit that was not cleft in the above instances.

Strike prevents inspection.--An incident at the port of Seattle is recorded as an example of how circumstances over which we have no control may affect the safeguarding of foreign plant material. A shipment of 60 cases of fresh persimmons arrived in Seattle on the American S. S. President Jefferson for T. and E. movement to Canada. This shipment arrived on November 11 but, owing to strike conditions at that port, was not exported to Canada until February 15. During the period November 11 to February 15 there was no crew on the vessel and it was impossible to obtain permission from the Longshoremen's Union to remove any of the cargo, therefore the persimmons, together with a great many shipments of lily bulbs consigned to Europe and Canada, had to remain on board the S. S. President Jefferson until the strike had been settled.

Attempted smuggling of Mexican citrus fruit.--Recently two couples crossed the Laredo Bridge into Mexico. While there they purchased 200 oranges, intending to take them back to Arkansas with them. The oranges were taken up at the bridge and one fruit fly larva was found in one of them. Three elderly women arrived on the bridge at Laredo on their way back from a trip to Mexico. After their baggage had been removed, the inspector asked if they had any fruits or plants about the car. One of them replied that they had three oranges left. Three oranges and one sweet lime were found in a basket on the front seat of the automobile. The inspector took them, continued to search the car, and found other fruit concealed in the sleeve of a coat. He asked the ladies if these three oranges were all the fruit that they had about the car, and they declared that it was. The inspector produced from the aforementioned coat sleeve (which had been fastened at each end with safety-pins to keep the fruit from rolling out) six oranges and three sweet limes hidden therein. One of the women paid the \$2 fine assessed without protest.

DOMESTIC PLANT QUARANTINES

Peach mosaic disease.--Cooperative Federal-State inspection for the peach mosaic disease in the infected States is well under way with a force of 75 inspectors. In Colorado the present indications are that there is approximately one-fifth as much mosaic in the affected area as was found last year. Such decline of the disease is apparently due to the prompt and complete eradication of infected trees in 1935-36. Reports from Texas state that in the El Paso district eradication work is being performed on 90 percent of the properties on which the disease occurs. Eradication is being conducted along with the inspection as soon as the consent of the owners is obtained. In the eastern half of Texas 12 inspectors are inspecting the 5-mile zones surrounding nurseries and the sources of budding wood used in such nurseries. A disease-free radius of 5 miles, as determined by careful and competent inspection, is required as a standardized condition of certification for shipping from infected areas, under recently established State quarantines. The California survey indicates an increase in the disease of one to five times over that of last year. The tree-removal project is continued cooperatively with the State, providing employment for approximately 125 workers. Good cooperation is being obtained from owners of infected properties. So far as is known, California and Colorado are the only States where the disease exists in extensive commercial peach areas. Infections in other States, namely, Arizona, New Mexico, Utah, and Texas, are confined to areas not so important commercially. The results of the field work of the past two seasons indicate that if inspection and eradication are continued the spread will be checked and the disease eradicated before extensive economic losses are sustained.

Phony peach inspection.--With a force of approximately 75 Federal and State inspectors, extensive scouting in affected States is being conducted to determine the spread of the phony peach disease. To protect accomplishments of past years, and especially the favorable status at the close of the 1936 season, it is extremely desirable to reinspect in 1937 all known infected properties in order to find diseased trees in which symptoms were not visible last year. The campaign has now accomplished economic control, even in the heavily infected areas, and it is not unreasonable to expect ultimate eradication under such a continued program of inspection in subsequent years.

Transit-inspection activities.--During the spring season for shipping nursery stock transit inspection has been carried on at 16 of the more important terminal centers throughout the United States. In the first 4 months of 1937, approximately 600,000 shipments moving via mail, express, and freight have been inspected, of which approximately 1,000 were found to be consigned in violation of quarantines relating to the Dutch elm disease, the Japanese beetle, the gypsy moth, the black-stem rust of grains, the pink bollworm, the white pine blister rust, and the Mexican fruit worm.

White pine nurseries inspected.--Fifty-six applications have been received for permits to ship white pines during the fiscal year 1938 under the provisions of Federal quarantine No. 63, from States infected with blister rust,

and the inspection of such nurseries is being made in the Middle West and also in Eastern States. Indications are that a number of nurserymen are making arrangements to increase their sowing of white pine seed this summer to meet the increased demand for stock for reforestation purposes. An unusually large number of shipments of seedling forest stock is reported by the transit inspector at Pittsburgh.

Citrus canker activities.--Inspection for citrus canker and the destruction of abandoned groves and of Citrus trifoliata was begun in west Florida in April. This is a continuation of the project in the contiguous area in southern Mississippi and Alabama where thorough inspection has been made of the entire citrus-growing districts, comprising eight counties. No canker was found in these recent inspections; however, over 5,000,000 worthless citrus trees have been destroyed in Mississippi and Alabama up to April 24, under the emergency project. In Louisiana and Texas persistent search for the canker is continued from year to year in all citrus-growing areas in order to find and eradicate the last vestige of this disease. In Louisiana the disease was found in April on one tree in Saint Charles Parish. Only three infected properties were found in that State in 1936. In Texas, although the disease has recently recurred on several properties in Galveston and Brazoria Counties and to a less extent in Harris County, the infected trees are chiefly seedlings of recent growth. These infected trees are promptly removed and the areas reworked with relief crews. The inspection work is conducted cooperatively with the States concerned.

Coast Guard furnishes boat for island inspection.--Citrus canker inspectors and relief crews in Mississippi were recently saved considerable time and expense in reaching six islands from 10 to 15 miles off the Mississippi coast, through the cooperation of the Coast Guard in furnishing a boat for 3 days. One thousand wild citrus trees were found and destroyed.

Terminal inspection of parcel-post shipments extended to State quarantines in four States.--Arrangements for enforcing State quarantines under the act relating to terminal inspection, as revised by the Buck Amendment on June 4, 1936, have recently been made by the States of California, Mississippi, Montana, and Oregon.

Japanese beetle quarantine regulations amended.--Effective May 10, the regulations of Federal Quarantine No. 48 were amended to add certain Maryland and Virginia districts to the area from which the movement of fruits and vegetables of any kind by refrigerator car or motor truck is restricted, and to authorize the Chief of the Bureau to extend or reduce such area by administrative instructions. The amended regulations also specify the conditions under which permits or certificates may be issued to authorize the movement of such products from a regulated area through a nonregulated area to another regulated area.

INSECTICIDE INVESTIGATIONS

Particle size and toxicity.--This Division has recently acquired a Federal Air Classifier, a device which by means of air currents separates powdered materials into fractions of different average particle size. It has proved capable of dividing considerable quantities of a paris green, such as Chipman's air-floated product, into distinct fractions and Divisions that are interested are invited to consider testing these fractions. Paris green is being used because it is sufficiently granular to furnish a considerable range of particle size and is a definite chemical compound (unlike calcium arsenate), which remains chemically homogeneous during the treatment in the air classifier.

Fluoride residues.--During the past several years the cooperative experiments run by the Division of Insecticide Investigations and the Division of Fruit Insect Investigations at Yakima, Wash., in the removal of cryolite residues from apples have indicated that such removal was difficult; however, it was always recognized that the methods used for the determination of the fluorine were not satisfactory. Last season's fruit was washed and stored until the Division could procure a photometer for use with the colorimetric procedure developed by the Food and Drug Administration. The results for last year have therefore just recently been obtained and the picture appears quite different. The residue from five sprayings with cryolite, containing 0.130 grain F per pound, were reduced below the tolerance of 0.010 by every washing treatment tried, and a residue of 0.180 was similarly reduced by the better treatments. This finding agrees with the work of various other investigators and indicates that the fluoride insecticides merit additional attention from entomologists.

BEE CULTURE

Cage for controlled mating of queens on the wing.--A cage 20 by 20 by 20 feet made with copper-screening sides and top, has been constructed at the Beltsville, Md., laboratory to test the possibility of having queens mate on the wing within such enclosures. This work is being done following the announcement from a private breeder in California that he has had rather good success in a similar undertaking. A number of years ago an unsuccessful attempt was made by the Bureau along similar lines but using a tent presumably of smaller dimensions. Detailed records of this earlier work are not at hand. The success of such an experiment would greatly speed up breeding work with bees, as controlled mating of bees by artificial insemination still belongs to laboratory technic and is somewhat slow and difficult.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

New coleopterous larval material received.--In the course of the insect survey of peach orchards, conducted by the Division of Fruit Insect Investigations in an effort to find possible insect vectors of the phony peach disease, certain species of Coleoptera have been reared by W. H. Anderson. Larvae and adults have thus been definitely associated. The

larval and pupal skins, together with the adult specimens of Agonum limbatum Say, A. punctiforme Say, Nothopus zaibroides Lec., and Chauliognathus basalis L., have been deposited in the National Museum collections. The first three of these species are Carabidae, while the last belongs in the Cantharidae. According to A. G. Boving, this material represents the first correlation of larvae and adults in these cases and makes a valuable addition to the reference collections. From the Division of Foreign Plant Quarantines there have been received, under Hidalgo, Tex., Interception No. 2437, two small curculionid larvae with associated adults. The latter have been determined by L. L. Buchanan as Anthonomus testaceosquamosus L. No larvae of this species were previously contained in our collections, nor has this stage been described. Rather severe injury was caused by this weevil to the blossom buds of Althaea at Hidalgo. Reared material of the character represented by these two lots is of the greatest value in extending our knowledge of the classification of immature forms.

Taxonomic studies on elaterid larvae.--Robert A. Glen, of the Canadian Entomological Branch, has spent approximately 6 months in Washington in close association with A. G. Boving. He is engaged in a taxonomic study of wireworms, particularly the genus Ludius, a group which is of considerable economic importance in Canada and the United States. During his stay he was able to investigate, describe, and make figures of all of the species of Ludius in our collection and, with the assistance of Dr. Boving, succeeded in obtaining additional material for study from various private entomologists and foreign entomological institutions. This visit was necessary from the standpoint of that project of the Canadian Entomological Branch and it also resulted in definite benefits to our collections. Mr. Glen has sorted and identified our undetermined larval material in the genus Ludius and has added to our collections a number of species not previously represented, as well as more than 50 new slides of dissections prepared to show the structural details employed in his descriptions.

Extension of the known southern range of the pepper weevil.--Three specimens of Anthonomus eugonii Cano, collected on sweet peppers at Chimaltenango, Guatemala, were recently received from J. R. Johnston. There are also two specimens from La Ceiba, Honduras, in the National Museum collection. These localities are apparently the most southern mainland records for this weevil, although the species has previously been reported from Trinidad. It has several times been suggested that eugonii Cano is a synonym of mexicanus Boh., but L. L. Buchanan reports that a comparison of them, including the male genitalia, shows that they are quite distinct.

Puerto Rican record for an injurious cerambycid.--W. S. Fisher has identified as Xystrocera globosa Oliv. (family Cerambycidae) a beetle from Santurce, P. R., submitted under San Juan Interception No. 6808. The genus Xystrocera is essentially Oriental, whereas the species globosa is widely distributed throughout southern Asia, the Malay Archipelago, the Philippine Islands, Egypt, and Africa. In Egypt the larva of X. globosa is known as one of the principal enemies of shade trees. This is the first American specimen to be received for determination and evidently represents an introduction. If definitely established, the species may become a serious pest.

Change in a family name in the Diptera.--It was shown in 1932 (Malloch, Bull. 98, Bernice P. Bishop Mus., p. 205) that the well-known dipterous family name Ortalidae needed to be suppressed in favor of the name Otitidae, the typical generic name, Ortalis, being preoccupied in ornithology. Otitidae is still a relatively unfamiliar name to those who are not engaged in taxonomic studies in the Diptera, and so many inquiries have been received from Bureau workers regarding the application of this name that it seems desirable to include this brief statement here.

On parasites associated with the San Jose scale.--P. L. Rice, assistant entomologist of the Delaware Experiment Station, recently submitted for identification a lot comprising several hundred specimens of Chalcidoidea reared by him in the course of a survey of the natural enemies of the San Jose scale, Aspidiotus perniciosus Comst. This material comprised rearings from more than 50 different collections of scale-infested twigs taken in 12 different States, from Delaware and New York to Oregon and California. It was studied by A. B. Gahan and found to comprise 20 different species. Most of these had already been recorded from this host but several records were of species not previously so associated. Of especial interest were specimens of an anomalous trichogrammid, Zaga latipennis Gir., and others apparently belonging to the aphelinine genus Coccophagoides and doubtfully identified as C. kuwanae Silv. Z. latipennis has previously only been known from two specimens reared in 1895 at Charlottesville, Va., from apple twigs infested with San Jose scale. Mr. Rice's specimens of this species were reared from similarly infested apple twigs taken at Parma, Idaho. The record is interesting as tending to confirm the association of the species with San Jose scale, although its exact relationship to the scale is not yet settled. The genus Coccophagoides has not previously been recorded from America. Rice's specimens were reared from infested apple twigs collected at Waltham, Mass. Other species found in the Rice material not before recorded as associated with this scale were the aphelinine Marietta mexicanus How. and two species of Mymaridae, namely, Polynema howardi Gir. and Anagrus nigriventris Gir. The actual parasitization of the scale by the mymarids is perhaps open to some question. The three most abundant parasites reared by Rice were Prospaltella perniciosi Tower, Aphytis diaspidis How., and Aphytis mytilaspidis How.

Records of a Central American leafhopper in the United States.--A single male specimen of Baldulus elimatus (Ball) was found by P. W. Oman in material collected by Wm. F. Turner and associates in El Paso County, Tex., on March 29, 1937. This leafhopper has never been reported in literature from north of Mexico, although this appears to be the second record of its occurrence in the United States. The first record is from a male specimen collected at Patagonia, Ariz., on Soncita Creek on October 14, 1927, by J. A. Kutsche.

Census of insect species and names.--While any figures on the numbers of insect species in existence must be considered estimates only, the following are believed to be approximately correct. They were arrived at after a careful consideration of various factors, and in many cases include actual counts of the species listed in catalogs, and in the Zoological Record for

the years subsequent to the appearance of those catalogs. Previously published estimates have been confined to the numbers of supposedly valid species described; however, since the taxonomists must deal with all the names that have been employed, whether valid or synonyms and whether species, subspecies or varieties, an attempt has been made to obtain such figures as well. Furthermore, since we have a particular interest in the fauna of North America north of Mexico, separate figures are given for that region. All of the estimates may be considered as extending to the end of the year 1936.

Insect orders	World fauna		Nearctic fauna	
	Names	Recognized species ^{1/}	Names	Recognized species ^{1/}
Anoplura-----	280	250	35	30
Coleoptera-----	331,200	248,800	30,700	25,600
Collembola-----	1,200	1,100	280	250
Corrodentia-----	960	875	110	95
Dermaptera-----	1,350	1,050	20	15
Diptera-----	89,700	73,000	19,000	15,000
Embioptera-----	140	115	4	4
Ephemeroptera-----	1,400	1,270	580	507
Hemiptera-----	55,300	48,000	10,900	7,400
Hymenoptera-----	118,000	102,000	19,500	16,700
Isoptera-----	1,700	1,600	65	59
Lepidoptera-----	146,000	105,000	15,000	10,500
Mallophaga-----	2,800	2,500	380	300
Mecoptera-----	360	310	75	65
Neuroptera-----	4,650	4,350	310	275
Odonata-----	5,000	4,500	480	400
Orthoptera-----	25,000	21,000	1,900	1,150
Plecoptera-----	1,500	1,260	280	230
Protura-----	60	50	25	20
Siphonaptera-----	1,050	900	300	260
Thysanura-----	300	270	40	30
Thysanoptera-----	2,800	2,500	500	450
Trichoptera-----	4,500	3,600	600	500
Total-----	795,250	624,300	101,084	79,840

^{1/} Does not include subspecies and varieties, except in the case of the ants (contained within the Hymenoptera).

It will be noted that the above figures cover only the Insecta. Mites and other arachnids are not included. The only estimates at present available for the Acarina indicate approximately 16,000 recognized world species, with about 1,600 known from North America north of Mexico.

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VOLUME IV

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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

NEWS LETTER

FOR MAY 1937

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INFESTED FOODS SEIZED

The Federal Food and Drug Administration in a press release on June 4 reports that, as a result of emergency fumigation during the maritime strike on the Pacific coast, 9,340 shipping cases of raisins contaminated with hydrocyanic acid gas were rounded up. With the re-establishment of normal operations in the shipping industry, says the Food and Drug Administration, the danger to the consumer from poisons of this sort has been eliminated.

Insect infestation caused the following seizures: 22 cases of canned huckleberries and 720 pounds of frozen huckleberries, both wormy; 300 pounds of wormy and rancid pecan meats; 225 pounds of dried peaches and 250 pounds of dried prunes, insect infested; 104 cases of tomato puree containing worm particles; and 509 cases of catsup with worm particles.

RED SCALE PARASITE INTRODUCED

Seven minute parasites (Habrolexis), which are definite enemies of the red scale that infests citrus orchards in California, have been received at the Citrus Experiment Station at Riverside, according to a recent announcement by L. D. Batchelor. They come from the citrus districts of South Africa, having been discovered and sent here by Harold Compere, entomologist at the station, who was sent to South Africa at the expense of the organized citrus growers of California. "Citrus growers should understand that this parasite is just a 'promise' of a biological control for red scale", said Harry Smith. "As yet we have no evidence that it will ever become an adequate control. Naturally we hope it will completely control this costly pest. It will take us probably a couple of years to find out." (California Cultivator, May 8, 1937.)

AIRPLANE DUSTING

J. H. Currie, author of "Air Raid on Pests" in the Farm Journal for July 1937, says: "It is on the Pacific coast that airplane dusting has been most widely used * * * Hard as it is to get actual figures showing acreage dusted or sprayed, a report of the California Department of Agriculture shows that over 100,000 acres were dusted or sprayed by plane in California in 1935. Authorities agree that this acreage was increased in 1936 * * * Better equipped planes and better trained personnel have greatly assisted in reducing costs, until in many sections they now compare favorably with ground dusting. The latest planes used in this work are built specially for dusting or spraying * * * Some of the new planes carry from 500 to 1,100 pounds of dust, depending on the altitude and type of landing field used. It requires from 8 to 50 pounds of dust to cover an acre, depending on the crop. Liquid sprays are harder to apply than dusts, but recent improvements in atomizers are making them much more popular * * * Custom work, most of it is. A California operator recently told me that he charged from 3 to 3½ cents a pound to apply dusts and from 23 to 30 cents per gallon for spray. The farmer usually supplies the insecticide and hauls it out to the landing field."

FRUIT INSECT INVESTIGATIONS

Laboratory closed at Wooster, Ohio.--The work of the Bureau on the insecticidal value of oils, carried on in cooperation with the Ohio Agricultural Experiment Station at Wooster, has been discontinued. In the oil investigations certain products which are of promise in the control of scale insects were developed.

Field headquarters established at Salisbury, N. C., for Japanese beetle work.--Field headquarters for studies of the Japanese beetle in the outer zone of spread, with James F. Cooper in charge, have been established at Salisbury, N. C. The work will relate to isolated infestations and to the factors influencing establishment, increase, and spread in that general area. Temporary laboratory space has been arranged for in the courthouse at Salisbury.

Ethylene dichloride more effective against peach borer in winter.--The results of experiments just completed by Oliver I. Snapp and J. R. Thomson of the Fort Valley, Ga., laboratory, show that ethylene dichloride emulsion is more effective against *Conopia exitiosa* Say and less toxic to peach trees when used during cold weather. Although good results were obtained from the fall applications, better results were obtained from applications made during the winter. The winter experiments also showed that pouring ethylene dichloride emulsion around the base of the tree is equally as effective and in some cases more effective than applications made with a sprayer. The method appears applicable to orchard trees of all ages, as well as to nursery stock in the row and dug nursery stock in bundles heeled in in an upright position. The quantity needed for effective results ranges from ¼ pint of 5-percent emulsion on nursery trees to ½ pint of 25-percent emulsion on 7-year-old trees.

Dried fruit beetle in soil.--Dwight F. Barnes and Charles K. Fisher, of the dried-fruit insects laboratory at Fresno, Calif., examined 733 samples of soil from 3 fig plantings during the period February 10 to April 20, to determine the population of Carpophilus hemipterus L. In an orchard of the Mission variety the population decreased from 924 per tree (about 46,200 per acre) on February 10 to none on March 30. The decrease in an Adriatic planting was from 1,775 per tree on February 10 to none on April 20. The reductions appear to be caused by long exposure in cold wet soil (specific cause unknown) and, during March and April, by transformation and emergence. Larvae and pupae, but no adults, were recorded. The Shirck soil washer was used to remove the insects. In another Adriatic planting, in which waste fruit had been cleaned up last fall, the population was very small, in contrast to the condition 1 year before in the same location, where waste figs on the ground had been abundant following the harvest of 1935. This appears to demonstrate that orchard sanitation following harvest will reduce the population of the dried fruit beetle which passes the winter in the soil.

MEXICAN FRUIT FLY

Clean-up work completed in lower Rio Grande Valley.--The number of adult Anastrepha ludens Loew taken in traps decreased noticeably during May. A total of 878 adults was taken in traps. All but 21 of these, however, were trapped before the middle of the month. Fruit fly larvae were collected from 49 properties during the tree-to-tree inspection. With the exception of a very few properties needing rechecking, all of the clean-up work is completed and no fruit susceptible to infestation is known to exist within the lower Rio Grande Valley. The taking of the 1937 citrus census is now in progress. A total of 1,229 adult fruit flies and a total of 318 larvae, or a grand total of 1,547 adults and larvae, were taken in May on the Texas side of the Rio Grande. The numbers of each species are shown in the following table.

Species	: Adults trapped	: Larvae collected
<u>A. ludens</u> -----:	878	: 318
Premises-----:	182	: 49
:	:	:
<u>A. serpentina</u> Wied--:	3	: --
Premises-----:	3	: --
:	:	:
<u>A. sp. "Y"</u> -----:	1	: --
Premises-----:	1	: --
:	:	:
<u>A. pallens</u> Coq-----:	347	: --
Premises-----:	108	: --

CEREAL AND FORAGE INSECT INVESTIGATIONS

Select strains of alfalfa resistant to pea aphid.--L. G. Jones, Sacramento, Calif., reports that, in the seasonal tests made in 1937 in the Antelope Valley in contrasting the aphid populations based on the total number of aphids on 100 plants selected at random in samples of 25 plants from 10 commercial fields with samples from resistant and susceptible plants from 2 test plats, it was noted that the resistant plants had a low population throughout the observation period and that the percentage of increase on resistant plants was not consistent, although the population on susceptible plants grown in the plats compared favorably with the population counts in commercial fields. It is thought that most of the aphids found on the resistant plants were migratory, making the population recorded from these plants unstable and ephemeral. The table below shows the results obtained in commercial fields and in test plats on the basis of total aphids per 100 plants in Antelope Valley in 1937.

Date	Commercial fields		Test plats			
			Susceptible		Resistant	
	Average		Average		Average	
	Plants : aphids per : examined:100 plants	Plants : aphids per : examined:100 plants	Plants : aphids per : examined:100 plants	Plants : aphids per : examined:100 plants	Plants : aphids per : examined:100 plants	Plants : aphids per : examined:100 plants
	Number	Number	Number	Number	Number	Number
January 26-----	250 : 916	50 : 220	50 : 44			
February 24----	250 : 331	50 : 96	50 : 8			
March 17-----	250 : 657	50 : 210	50 : 32			
March 30-----	250 : 1,194	50 : 1,048	50 : 24			
April 16-----	250 : 7,986	50 : 6,950	50 : 50			
April 29-----	250 : 15,138	50 : 14,160	50 : 198			
May 27-----	250 : 48	50 : 32	50 : 2			

Factorial analysis of inheritance of alfalfa resistance to pea aphid awaits confirmation.--L. G. Jones, Sacramento, Calif., reports that, in the crosses of resistant and susceptible strains of alfalfa to the pea aphid the 500 F₂ progeny that have been used in tests to date showed that from 21 to 23 percent of the plants were susceptible. The failure of this group to reach the expected 25 percent, together with the fact that a higher percentage of the plants reacted resistant than was expected, precludes any positive statement on the factorial make-up of the resistance. The testing of F₃ rows in 1937-38 will establish the number of factors involved.

Appearance of pea aphid in Kansas.--W. T. Emery, Manhattan, reports that the pea aphid has recently appeared in numbers in alfalfa fields in the vicinity of Manhattan. This species was destructively abundant in alfalfa fields in Kansas in the spring of 1934, but unfavorable climatic conditions reduced its numbers until in 1936 extensive sweepings failed to take a single aphid. Specimens were first taken this year on April 17 on flight screens used to check the migration of chinch bugs. They were swept in numbers from alfalfa fields on May 6.

Behavior of third-year grubs varies with locality.--T. R. Chamberlin, C. L. Fluke, Lee Seaton, and John A. Callenbach, Madison, Wis., report that third-year grubs remained deep in the soil during the month in the sample pastures at Lamont and Gays Mills, but at Leeds, in Columbia County, Bristol, in Kenosha County, and at various places in Dane County, third-year grubs came up and in some areas caused considerable injury to lawns, strawberries, and pastures. This difference in behavior is not due to the species concerned, because at Gays Mills where the grubs are down and at Leeds where they are up the species are largely Phyllophaga rugosa Melsh. and P. fusca Froel. At Lamont the grubs for the most part are P. hirticula Knoch. It is believed that the differences in feeding conditions last year may have been responsible for the variable behavior this year. According to Mr. Fluke, third-year grubs have not been found in southern Wisconsin feeding near the surface in the last 7 or 8 years.

Flight of June beetles in southern Wisconsin.--Messrs. Chamberlin, Fluke, Seaton, and Callenbach also state that the weather in May was in many respects similar to that of May 1935; consequently flight of the beetles began rather slowly and, if present conditions continue, may be expected to persist throughout June. The following species were taken in May: P. fusca, P. hirticula, P. rugosa, P. ilicis Knoch, P. tristis F., P. nitida Lec., P. marginalis Lec., P. anxia Lec., P. prunina Lec., P. drakei Kby., P. implicata Horn, P. spreta Horn, P. villifrons Lec., P. futilis Lec., and P. balia Say. P. hirticula predominated at Lamont, P. rugosa at Gays Mills, and P. fusca in the other areas studied. Only a single male specimen of P. spreta was taken. This was from butternut at Gays Mills. Only a male and a female of P. villifrons were taken. These were from surface trash at Madison and were the first specimens of this species taken by this laboratory.

The grasshopper situation in California.--C. C. Wilson, Sacramento, says that the outbreak of grasshoppers in 1937 has been largely confined to San Diego and Imperial Counties in the south and to Siskiyou and Modoc Counties in the northern part of the State. The decrease elsewhere within the State may be attributed to three factors: The timely application of poisoned bait in 1935 and 1936, the large number of grasshoppers devoured by parasites and predators, and the effect of climate. In the coastal area the systematic and persistent use of poisoned bait during the early nymphal stages appears to have been the major factor. However, on many egg beds (survey of 1936), Bombyliidae and Meloidae played an important part in this reduction, often attacking over 50 percent of the eggs deposited. An examination on May 28, 1937, in Imperial County, showed 40 percent of the eggs to have been attacked by a hymenopterous egg parasite of an undetermined species. Although climate is a recognized factor in the abundance of grasshoppers, the effects of adverse conditions have received but minor attention. In 1936 an exceedingly dry fall in the Sacramento and San Joaquin Valleys caused many adults to die prior to oviposition. This fact is reflected by a light infestation in 1937 and no serious migration this season is anticipated. A high precipitation, 8 to 10 inches above normal, has occurred throughout the coastal area from Monterey to San Diego Counties, which has in some instances flooded oviposition beds,

on many of which hatching has not occurred; and since ample green vegetation is present in the natural habitat of grasshoppers, grazing and meadow land, no serious invasion into cultivated crops is anticipated.

The value of birds in grasshopper control.--Mr. Wilson also states that in San Luis Obispo County further study of the effect of birds in the reduction of the grasshopper population showed for the western crow, 15 per bird, with a maximum of 28 pairs of grasshopper mandibles; for Brewer's blackbird, $12\frac{1}{2}$ hoppers per bird; for lark-sparrow (nestling), 12 hoppers; for California horned lark, $1\frac{1}{2}$ hoppers each. The horned lark, crow, and blackbird were more numerous on the area studied, and the crow and blackbird may be considered a definite factor in the reduction of grasshopper population in May and June. These observations were made in cooperation with Johnson A. Neff, of the Bureau of Biological Survey.

Effects of fumigation on Mediterranean flour moth.--R. T. Cotton, Manhattan, Kans., reports that tests on the comparative toxicity of the common fumigants to the Mediterranean flour moth indicate that the vapors of chloropicrin, although not highly toxic to the egg stage, are remarkably effective against the adult stage. A dosage of less than 1/2 ounce per 1,000 cubic feet of space gives a 100-percent kill in 1 hour, at a temperature of from 72° to 76° F. This represents a toxicity of nearly double that of HCN under the same conditions. Since the fumigation of compact commodities under warehouse conditions is difficult and expensive, it would seem probable that occasional treatments with light dosages of chloropicrin would be useful in holding down warehouse infestations of Ephestia moths.

Strains of grass resistant to hessian fly attack.--According to E. T. Jones, Manhattan, recently completed greenhouse tests to determine the relative susceptibility of 22 strains of 11 species of grasses of the genus Aegilops, showed that 13 strains were susceptible to development of the hessian fly. Two strains each of A. cylindrica and A. ventricosa were found resistant to fly development. Listed in order of increasing susceptibility, with a range of 21-percent infestation for A. cylindrica WN. 2433, to a 76-percent infestation for A. ovata globosa, the susceptible strains are: A. cylindrica WN. 2433, A. crassa rubignosa, A. triaristata ss recta, A. tauchii P.Q. 77691, A. ovata WN 2477, A. bicornis, A. cylindrica rubignosa, A. crassa rubescens, A. triuncialis WN 2484, A. triuncialis nigro albens, A. squarrosa (Bruner), A. biuncialis, A. columnaris, A. ovata Ks. glabrous, A. triaristata GH 1934, A. triuncialis Ks. pubescent, A. triuncialis (Tiflis) and A. ovata globosa. Ceres wheat checks averaged 88-percent infestation in the tests.

Importations of hessian fly parasites.--C. A. Clark also states that on May 19 a shipment of the hessian fly parasite Platygaster pleuron Walk. was received at New York off the S.S. Berangaria. The consignment, consisting of 352 adults, was taken to Moorestown in an iced container and placed in cold storage until the following day, when it was delivered to E. J. Udine, of the Carlisle, Pa., laboratory. A second shipment of P. pleuron, consisting of 380 adults, was received at New York on May 24 off

the S.S. Queen Mary. This consignment was taken to Moorestown in an iced container and delivered on the same day to C. C. Hill, of the Carlisle laboratory. Mr. Hill reported that over 300 of the adults in the May 19 shipment had reached Carlisle alive and in good condition.

Macrocentrus gifuensis Ashm. collected in Massachusetts and shipped to Canada.-- Mr. Clark and E. D. Burgess, Moorestown, N. J., report that during the period May 4 to 7 a small collection of corn borer larvae was made at Dighton and Bridgewater, Mass., to furnish a breeding stock of M. gifuensis to the Entomological Branch of Canada. A total of 804 larvae (119 from Dighton section 1 and 685 from Bridgewater section 13 of the 1936 parasite field status survey) were isolated and placed in the incubator at Moorestown. On May 28 a shipment of 98 males and 72 females of the parasite was sent via air express to the Dominion Parasite Laboratory at Belleville, Ontario, Canada. The following day a similar consignment containing 28 males and 55 females was shipped to the same destination, bringing the total numbers of these parasites shipped to 253, of which 126 were males and 127 females. All were reared from the Massachusetts material.

JAPANESE BEETLE CONTROL

Scouting of railroads by autogiro.--On May 21 four two-man scout crews and a supervisor in cars, together with an autogiro and pilot left the Bloomfield, N. J., field headquarters for Montgomery, Ala., where they began the systematic scouting of railroad rights-of-way over which imported burl elm logs moved from ports of entry to Midwestern veneer mills. The itinerary of the autogiro and the follow-up ground crews involves coverage of the Louisville & Nashville Railroad from Montgomery, Ala., to New Orleans, La.; the Southern Railroad from New Orleans to Birmingham, Ala.; the Louisville and Nashville from Birmingham to Montgomery; the Atlanta and West Point Railroad from Montgomery to Knoxville, Tenn.; the Southern Railroad from Knoxville to Birmingham; the Louisville and Nashville from Birmingham to Louisville; the Illinois Central Railroad from Louisville to New Orleans; the Missouri Pacific Railroad from New Orleans to Kansas City; the Missouri Pacific and Pennsylvania railroads from Kansas City to Effingham, Ill.; the Illinois Central Railroad from Effingham, Ill., to Fulton, Ky.; the Baltimore & Ohio Railroad from Fulton to Louisville, Ky., and thence to Cincinnati, Ohio; and the Norfolk and Western Railroad from Cincinnati to Norfolk, Va. This southern loop comprises slightly over one-half of the 11,665 miles that will be scouted by autogiro. For the 4 flight days of the first week of scouting, the autogiro crew averaged 330 miles per day. The second week the coverage was reduced to an average of 202 miles per day's flight. As the scouting proceeds, location sheets on which wilted elms observed have been spotted from the air are turned over to the various crews at the end of each flight. The ground crews then locate and sample each tree showing characteristic symptoms of the disease. If more than a day is required to locate the elms spotted by the observer, the aerial crew waits for the ground crews to catch up. Flights are made slightly to either side of the

railroad rights-of-way to give the observer a vantage point from which all nearby elms are visible. Although the flights will follow closely along the right-of-way, any elm within view of the observer and showing symptoms of the disease will be circled and inspected. At all points where streams or ravines intersect the right-of-way, flight will be diverted to examine any elm concentrations along such offshoots.

Scout-training schools for W. P. A. workers.--Scout-training schools in New York were started in Westchester and Dutchess Counties on May 24 and in Rockland County on May 25. In Westchester County 145 men started training. Of these, 120 had some previous scouting experience. The other 25 are from sanitation crews but are inexperienced in scouting. In New Jersey final instructions were given to county supervisors on May 29 preparatory to the starting of scout schools in all counties in the infected zone. All personnel from the New Jersey sanitation crews will be given scout training. Those who do not qualify will be returned to sanitation work. W. P. A. offices in Bethlehem, Easton, and Doylestown, Pa., were contacted and arrangements were made to obtain men when requisitions are submitted. A tentative selection of a site for the Pennsylvania scout school was made near Easton.

W. P. A. personnel referrals.--From March 11 to May 4 requisitions were placed with the Connecticut W. P. A. organization for 115 men. One hundred and fifty-three men were referred to the State leader for consideration. Of these, 93 were qualified for the work and 66 accepted the assignment. Fourteen of the 66 did not report for work, and 3 quit shortly after reporting, leaving only 49 men to apply on the requisitions. Toward the end of the month the State W. P. A. executive manager of employment interested himself in the personnel situation in Connecticut and ascertained that the difficulty appeared to be with the welfare organizations in that they could not or did not refer the proper type of personnel to our representatives for interview. The manager instructed the welfare directors in Bridgeport and Stamford to have everyone eligible for W. P. A. assignments available for interviewing. The State leader was permitted first choice of any laborers that might be acceptable for Dutch elm disease scouting. Fifteen were selected in Bridgeport and 16 in Stamford, bringing the total W. P. A. personnel in the State to 272. This same procedure will be continued in Danbury and Norwalk, with the expectation that the scheduled quota of 301 men may be reached in time for the opening of the scouting season on June 1.

Typical wilting appears.--The first wilting of elm foliage typical of the Dutch elm disease was observed on May 24 in the town of Patterson, in northeastern Putnam County, N. Y. This tree was noticed by members of a W. P. A. sanitation crew. On May 25 and throughout the remainder of the month, samples from wilted trees were sent in from lower Westchester County and The Bronx by New York State scouts operating in that territory. Wilted trees were found in the town of Goshen, Orange County, on May 26. From the entire infected zone in New York 28 specimens for laboratory culturing were collected during the week ending May 29.

Dutch elm disease publicized in magazine article.--Popular Science Monthly for May devotes two pages to an interesting, popularly written article on the Dutch elm disease. Cuts used to illustrate the article depict autogiro scouting, eradication of a diseased street tree, a cross section of a twig showing streaking caused by the fungus, the use of a chain saw in bucking up logs for burning, coremia of Ceratostomella ulmi, and an enlarged photograph of Scolytus multistriatus Marsh., the principal insect vector of the disease in this country.

Steel rails protected from gypsy moth infestation.--In southern New Hampshire the Boston & Maine Railroad has started to remove the rails from 16 miles of abandoned track. Gypsy moth infestation along this stretch is very heavy. Eggs started hatching on May 10 while the rails were being torn up. At the behest of the district inspector in that territory, the railroad has agreed to store the rails in a location well removed from any tree growth. As larvae will be unable to survive near the rail-storage piles, the rails may be shipped later without danger of carrying gypsy moth infestation.

Gypsy moth infested shipments.--Infestations, totaling 26 egg clusters, were found on the examination of 13 shipments of quarantined products offered for shipment during the month. With the exception of one egg cluster found on lumber, all infestations were taken from nursery stock.

Fumigation of refrigerator cars.--Several conferences were held during May with officials of the Pennsylvania Railroad and interested growers on the Eastern Shores of Maryland and Virginia concerning the fumigation of refrigerator cars for loading with potatoes. Cars of Eastern Shore potatoes are often loaded and started rolling without a definite destination, to be diverted en route, frequently to points outside the Japanese beetle regulated zone. Until a beetle flight is determined around a particular loading point, certification will be granted for potatoes shipped from that point in refrigerator cars that have been fumigated while empty. Prior to June 15, the effective date of the farm products quarantine, the railroad will send 2,500 refrigerator cars into this territory. After that date the railroad will voluntarily fumigate with hydrocyanic acid gas all refrigerator cars moving into the Eastern Shore. This work will be centered at a switching point near Wilmington, Del. The inspectors who supervise the fumigation will see that all hatches and doors are closed and will attach Department seals to the openings. The seals will not be broken until the car is aired at the loading point. Certificates will be issued for all carloads of potatoes proceeding from Eastern Shore points, irrespective of their probable destination. The cars may thereafter be diverted en route to any market in the country. Should a beetle flight occur at a loading point that would involve hazard of infesting the potatoes while they are being loaded, it will be necessary to fumigate the loaded car. The railroad is also providing cloth screens for the bunker doors that are opened for ventilation while the car is traveling through the infested area. It is anticipated that 12,000 carloads of potatoes will be certified from this area during the season.

Japanese beetle road inspection stations.--Eighteen road-patrol stations were in operation during the month on the principal highways leading from the regulated area. Five posts were located in Virginia, two on the Maryland-West Virginia State line, four in West Virginia, six in Ohio, and one on the Pennsylvania-Ohio State line. An intrastate vehicular inspection service maintained by 4 Pennsylvania State inspectors was in operation on 10 highways leading to the nonregulated area in northwestern Pennsylvania. Three of these State posts were operated on daily schedules, the remaining seven on stagger hours.

Suboffice established in Clarksburg, W. Va.--Classification of approximately 50 nurseries and greenhouses under the Japanese beetle quarantine regulations in the recently added regulated area in Hancock, Harrison, Marion, Monongalia, and Taylor Counties, and the city of Parkersburg in Wood County, has necessitated the stationing of an inspector in that territory. One of the experienced inspectors previously stationed in the Philadelphia district was transferred to Clarksburg on May 21. Desk space has been provided for this inspector in the county agent's office in the courthouse.

Japanese beetle trapping.--By the end of May trapping had been expanded to include Mobile, Ala., Jacksonville, Pensacola, and Orlando, Fla., Athens, Atlanta, Augusta, Savannah, and Toccoa, Ga., New Orleans, La., and Charleston and Columbia, S. C. Not a single Japanese beetle was caught at any of the trapping sites in May. Traps were placed in St. Louis, Mo., but the saturated-bait blocks for these traps will not be exposed until the date of probable beetle emergence for that locality.

FOREST INSECT INVESTIGATIONS

Winter kills southwestern pine beetle broods on Dixie National Forest in Utah.--J. A. Beal, of the Fort Collins, Colo., laboratory, reports that approximately 95 percent of the overwintering broods of Dendroctonus barberi Hopk. infesting ponderosa pine on the Dixie National Forest in southern Utah was killed last winter by abnormally low temperatures. Nearest weather records taken at Panguitch, some 15 miles from the infestation and at a lower elevation than the 8,500 feet at Panguitch Lake near the infestation, showed a minimum of -38° F. on January 9. During January and early February on several other dates the temperature dropped to -20° to -30° . The only surviving broods occur in extremely thick bark ($2\frac{1}{2}$ to 3 inches) at the base of infested trees and may have been protected by snow. Even in this thick bark only an occasional larva survived. Larvae of the Black Hills beetle (D. ponderosae Hopk.) on the Dixie National Forest survived the same temperatures.

Ecological studies of tent caterpillar started.--J. V. Schaffner, Jr., of the New Haven, Conn., laboratory, reports that sample plots were established in East Dorset, Vt., for a detailed study of the natural factors of control of the forest tent caterpillar. Daily records of humidity, temperature, evaporation, and precipitation will be taken during the larval and pupal periods and an attempt will be made to estimate the mortality

throughout the season and correlate this mortality with climatic factors. P. B. Dowden, of this laboratory, is collaborating in this experiment by studying the effectiveness of biological control factors. Studies of food-plant preferences of the insect are being conducted. Robert Hunter, a temporary assistant, is stationed at East Dorset to make the daily observations.

Parasites received.--P. B. Dowden and P. A. Berry, New Haven, report that a colony of 569 Leucopis obscura Hal., predator on Adelges piceae Ratz. was received from the Canadian Parasite Laboratory at Belleville, Ontario, on May 5. The flies arrived in excellent condition and were liberated the same day at Grantham, Vt. The infestation at that point is moderate, with a number of trees heavily infested, while several light infestations are present in that general area. Messrs. Dowden and Berry report that one cocoon of Diprion polytomum Htg., collected at Orange, Conn., on October 25, 1936, produced 49 adults of Microplectron fuscipennis Zett. this spring. Several colonies of this parasite were received from the Canadian Parasite Laboratory and were liberated at different points throughout the Northeast in 1936. This represents the first recovery of this parasite in the United States.

Insecticides and forest insects.--S. F. Potts, New Haven, reports that excellent control of the European pine shoot moth was obtained in the field by using concentrated spray mixtures of derris, derris resinate, free nicotine, and lead arsenate. The concentrations were as follows:

Lead arsenate 1 part--linseed oil 0.4 part--water 5 parts
Derris resinate 1 part--linseed oil 0.5 part--water 8 parts
Derris resinate 1 part--linseed oil 5 parts--acetone 2.5 parts
Free nicotine 1 part--linseed oil 5 parts--water 35 parts

Mr. Potts also reports that the sawfly Neodiprion sp. occurring on red pine at Groton, Mass., was treated in the egg and larval stages at the laboratory in a limited number of tests. Red pine shoots bearing several hundred eggs were treated with lime sulphur concentrate at dilutions of 1-10 and 1-20. In both dilutions, 100-percent kill of eggs was obtained. Several hundred larvae hatched in the check experiment and these were divided into 12 lots of 50 larvae each and were treated with lime sulphur as a stomach poison in 1-10 and 1-20, derris (containing 4 percent rotenone) 1-500 and 1-1,000 as a contact spray, derris 1-500 and 1-1,000 as a stomach poison, lead arsenate 2 pounds per 100 gallons, lime 10 pounds per 100 gallons, sulphur 10 pounds per 100 gallons, lime sulphur as a contact poison 1-10 and 1-20, and one check experiment. The results were as follows: Lead arsenate, derris, and lime sulphur in the concentrations used were very effective as stomach poisons. Lime was not effective. Sulphur was fairly effective, but not as effective as the polysulphides of lime sulphur. Lime sulphur, lime, and lead arsenate were not effective as contact insecticides, but derris was very effective as a contact poison.

A pine scale's biology.--Thaddeus Parr, New Haven, reports as follows on the biology of Matsucoccus sp. on pitch pine: "The immature females

appear never to emerge from the holes in the bracts of the twigs. Crawlers were found emerging from the holes in the bracts through the broken dorsal integument of a legless, immobile female. No mature or immature females have been found on the outside surface of the twigs or on the new growth. No woolly mass has been found inclosing eggs nor have eggs been found at the nodes or elsewhere." A few new places have been added to the known distribution. In Connecticut on a small island near New Haven and on the Pachaug State Forest, in the eastern part of the State, and in New Hampshire at Nashua and Madison.

Cooperative work on cankerworms.--C. W. Collins, of the Morristown, N. J., laboratory, states that members of the laboratory force have cooperated with the National Park Service in spraying for the control of cankerworms at the Morristown National Historical Park. Seventy acres of woodland were sprayed by means of an autogiro. The mixture used consisted of 200 pounds of lead arsenate, 10 gallons of fish oil, 3 gallons of paraffin oil, and 50 gallons of water. On each trip the autogiro carried about 50 gallons of this mixture and distributed it over approximately 6 acres. From visual observations the atomization, distribution, and adherence were very good. C. L. Griswold's observations in the vicinity of Morristown indicate that the spring cankerworm (Paleacrita vernata Peck) is the most abundant species on elm; while the fall cankerworm (Alsophila pometaria Harr.) is most abundant on oak, hickory, ash, apple, wild black cherry, and linden.

Notes on native elm bark beetle.--R. T. Webber, Morristown, reports: "Adults of the native elm bark beetle (Hylurgopinus rufipes Eich.) hibernate in tunnels which they form in the outer bark of living elm trees. Most of the beetles left their winter quarters and became active from May 10 to May 17, and by May 21 practically all the beetles had left hibernation."

Relation of Dutch elm disease to European elm bark beetle.--H. V. Wester, of the Bureau of Plant Industry, in cooperation with W. D. Buchanan, of the Morristown laboratory reports that it seems to be very important for the coremial stage of Ceratostomella ulmi to be present in the pupal chambers from which Scolytus multistriatus Marsh. emerges, in order for this beetle to act as a vector of the Dutch elm disease pathogene. The experiment consisted of five parts in which the same number of trees and beetles were used (see table following). In part 1 the beetles were removed from pupal chambers in which coremia were present. These pupal chambers were in the bark of C. ulmi-infected logs kept moderately dry. In part 2 the beetles were from the same logs as those in part 1, but they were from pupal chambers where no coremia were present. In part 3 the beetles came from the same diseased source tree as those in parts 1 and 2, but these logs were kept in moist moss. There were no coremia in the pupal chambers. In part 4 the beetles came from logs free from C. ulmi and were checks for the other parts of the experiment. In part 5 the beetles were from the same source as those in part 4, but after the beetles had fed for five days (which was the same for all the beetles in the experiment) a camel's-hair brush containing a C. ulmi spore suspension was brushed on the feeding injuries. When all of the above beetles were cultured,

C. ulmi was recovered only from those which came from pupal chambers in which C. ulmi coremia were present. C. ulmi was recovered from only those trees that were fed on by beetles that came from pupal chambers containing C. ulmi coremia, and in those trees that had a spore suspension brushed into the injuries. It should be mentioned that C. ulmi was recovered only from the wounds made by the beetles.

Source of beetles	Trees	Total :beetles :making :injuries	Beetles :trans-:mitting:C. ulmi:	Beetles :from :which <u>C. ulmi</u> was :cultured	Total :beetle :injuries:	Beetle injuries from which <u>C. ulmi</u> was cultured
	Number	Number	Percent	Percent	Number	Percent
Dry logs infected by <u>C. ulmi</u> ; coremia in pupal cells (part 1)---	6	10	60	100	14	50
Dry logs infected by <u>C. ulmi</u> ; coremia not in pupal cells (part 2)-----	6	12	0	0	18	0
Moist logs infected by <u>C. ulmi</u> ; coremia not in pupal cells (part 3)---	6	10	0	0	16	0
Logs not infected by <u>C. ulmi</u> (part 4)-----	6	12	0	0	14	0
Logs not infected by <u>C. ulmi</u> (beetle injuries artificially inoculated by <u>C. ulmi</u>) (part 5)-----	6	10	--	--	11	54.5

Relation between size of locust borer larvae on north and south sides of tree trunk.--In a study of locust borer activity on the sample plots at Cambridge, Ohio, in May, W. L. Baker, of the Columbus, Ohio, laboratory, observed that larvae on the southern exposure of the tree trunk were more active and perceptibly larger than were those confined to the northern exposures. Beginning May 12 collections were made at weekly intervals from

both exposures. The larvae were weighed immediately upon removal from the trees. A comparison of data (see table following) from the two exposures shows a decided difference in the mean larval weight, those from the southern exposure ranging from about 45 to 80 percent heavier than those from the northern.

Date of examination	Northern exposure		Southern exposure	
	Larvae	Average weight	Larvae	Average weight
	Number	Milligrams	Number	Milligrams
May 12-14-----	107	5.46	123	8.75
May 19-----	41	6.51	36	11.72
May 26-27-----	33	15.61	40	22.55

It is probable that the relative size of these larvae is a pretty fair index of the relative resistance of the two environments to the locust borer development during the early portion of the larval stage. Most of the larvae were in the bark, or cambium, during this period and were directly affected by bark temperatures. In general, prior to May 20 the weather was very cool and humid and only that portion of the tree trunk directly exposed to the sun's rays was favorable for larval development.

Woodpeckers important locally in reducing locust borer populations.--R. C. Hall, Columbus, reports that during the periodic examination of locust borer activity in May it was observed that woodpeckers were very active on all the sample plots at Cambridge. During the examinations early in May, while the larvae were still in the bark, a larger percentage were removed by woodpeckers than late in May, when most of the larvae had entered the wood. On the Cambridge plots over 50 percent of the spring locust borer larvae have been removed by woodpeckers to date. Woodpecker work has been observed at Minerva and Hopedale but in both of these areas only a small percentage of the larvae had been removed. The following table shows the percentage of locust borer larvae removed from trees on the different study areas in Ohio.

Location	Total larvae		Larvae removed by woodpeckers	
	Number		Number	Percent
Cambridge----	1,604		503	31.4
Minerva-----	2,153		116	5.4
Hopedale-----	1,780		50	2.8

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Gypsy moth work affected by climatic conditions.--During the first part of May debris on the ground in woodland areas in many localities became exceedingly dry. No burning of brush or debris could be safely done, except on rainy days or immediately after a heavy rain. Midway in the month unusually heavy rains fell throughout most of the area where Federal W. P. A. gypsy moth work was being performed, washing out some of the dirt roads and flooding lowlands. Climatic disturbances for the month culminated with a severe hailstorm, accompanied by high winds, in southern Connecticut, which broke off many tree branches. These will offer ideal locations for the deposition of egg clusters that will be difficult to discover from the ground.

Spraying preparations.--Many of the woodland areas where gypsy moth work will be done this season have been enclosed with fences to prevent animals from entering after treatment has been applied. Many unused roads have been conditioned so that spraying machines can be driven over them and hose lines have already been laid at several of the infestations.

Spraying materials distributed to the field.--Several trucks were kept in constant service during May distributing spraying supplies and equipment from the principal storehouses in Greenfield, Mass., and Wilkes-Barre, Pa. The magnitude of the undertaking is demonstrated by the amount of material moved from Greenfield. During 1 week the shipments consisted of 44,400 feet of 1-inch high-pressure spray hose, $37\frac{1}{2}$ tons of powdered arsenate of lead, 32 barrels of fish oil, and 50,000 yards of 8-inch bur-lap.

Thinning woodland improves grazing conditions.--Although the primary object of selective thinning of favored food species in woodland areas in the vicinity of gypsy moth infestations is to make the stand more resistant to attack by the insect and to improve it commercially, it has been observed that grazing conditions have materially improved in areas where such thinning has been done in pastured land.

Tractor used to advantage on mountain side.--A caterpillar tractor was instrumental in saving considerable time and labor on a mountain in Massachusetts. The tractor successfully transported a large quantity of barbed wire from the highway to the top of the mountain, a distance of approximately $1\frac{1}{2}$ miles, over a rugged trail. The tractor accomplished in a few hours work that would otherwise have required several days of hard labor.

New spray hose tested before acceptance.--The coupling and testing of 50,000 feet of 1-inch spray hose at the gypsy moth storehouse in Greenfield, Mass., and 20,000 feet at Wilkes-Barre, Pa., has been completed.

Eradication progress at Shawungunk, N. Y.--Federal W. P. A. and New York conservation department employees are continuing the eradication work against the gypsy moth in Shawungunk, Ulster County, N. Y. By the

middle of May the combined forces had scouted 12,830 acres of woodland and 60 miles of roadsides, and had destroyed over 27,300 egg clusters. Selective thinning of favored food plants to aid in clean-up operations and make the stand more resistant to gypsy moth attack had been done in an area totaling 78 acres. Burlap bands to trap the caterpillars were placed around more than 14,000 trees.

Elimination work continues at large infestation in Putnam Valley, N. Y.--Nearly 3,200 acres of woodland and over 30 miles of roadsides had been scouted up to May 15 by W. P. A., C. C. C., and State conservation department forces at the site of the gypsy moth infestation in Putnam Valley, Putnam County, N. Y. Over 73,000 egg clusters were destroyed in the course of the work. In addition, selective thinning work was done in 245 acres of woodland and burlap bands were placed around 92,800 trees.

Spraying completed in some residential sections in Pennsylvania.--More than 4,000 permits for gypsy moth spraying were obtained in the Pennsylvania area, mostly in the infested residential districts in the Wyoming Valley. Tree foliage developed to such an extent in these areas that 26 sprayer trucks began operations on May 17. By the end of the month spraying had been completed in the residential sections of the boroughs of Old Forge and Moosic, in Lackawanna County; Miners Mills, Plains, and Wyoming, in Luzerne County; and at the infestation discovered in Hanover Township, in Luzerne County.

Unseasonable mine activities increase inspection work.--An additional gypsy moth inspector was required to examine mine props and laggings cut within the area under quarantine in Pennsylvania. The increase in this type of work was unexpected and unusual at this time of year, for mine operations are normally rather slack during the summer months. To offset this there was a sharp decrease in the inspection of rhododendron and kalmia shrubs dug in the woods within the infested areas. The operators digging these shrubs temporarily suspended work, as conditions were such that they could not assure safe transplanting.

Minor interruptions in C. C. C. gypsy moth work.--There were 938 C. C. C. enrollees working on gypsy moth projects during the last week in May, distributed as follows: Massachusetts 463, Connecticut 190, Vermont 256, and New Hampshire 24. These numbers were slightly lower than those for the previous week, owing in part to the abandonment of camps and partly to the employment of gypsy moth men on other emergency work. For instance, all of the men in one camp in Connecticut were used to complete a road before a certain date; all of the men in one Massachusetts camp spent part of 1 day searching for a man lost in the woods; and all of the enrollees in one camp in Vermont were used during 1 day to seek a lost woman. Such temporary interruptions are unavoidable. During the present fiscal year, up to May 15, over 5,891,000 new gypsy moth egg clusters had been treated by C. C. C. enrollees. Of these, approximately 5,480,000 were creosoted in Massachusetts and the remainder in New Hampshire, Vermont, and Connecticut.

Reduction of C. C. C. personnel means dismissal of many trained men.--The number of C. C. C. enrollees working on gypsy moth projects has recently been materially reduced. Several camps were abandoned in Vermont, Massachusetts, and Connecticut in May. Supervision by this Bureau of the C. C. C. work in New Hampshire has also been discontinued, and the work there is now a State project; however, as the weekly reports from New Hampshire are still being received at the Federal gypsy moth office, the item is being included in the reports. Whenever possible the enrollees trained in gypsy moth work at the abandoned camps were transferred to camps where gypsy moth work is still being done, but not all of the experienced men could be accommodated in this way and many were dismissed.

Effects of abandonment of C. C. C. camps and 45-minute ruling on gypsy moth work.--The abandonment of several C. C. C. camps where gypsy moth work was performed, and the 45-minute ruling limiting the distance from the camps that the men can work, has forced the abandonment of much gypsy moth work that had been planned. It was necessary in some instances to remove burlap bands that had been placed around tree trunks, as it will not be possible to patrol them under the new conditions. In other places arrangements have been made for town or Federal W. P. A. crews to care for burlap, which is on the trees and cannot be tended in any other way.

Progress of the brown-tail moth work.--Scouting for brown-tail moth winter webs was gradually discontinued over the entire infested area during May, as the new foliage developed and concealed the webs.

PLANT DISEASE CONTROL

Susceptibility tests of barberry.--Barberry bushes of various species and varieties at Bell, Md., were inoculated during April with telia of Puccinia graminis tritici and P. graminis avenae from Pennsylvania and with P. graminis secalis and P. graminis agrostidis that had overwintered in Minnesota. Since the bushes leafed out irregularly this spring, infection did not include all the species and varieties in the plots. After reinoculation the latter part of April, most of the bushes became infected and the infection was heavy enough to indicate definitely the rust susceptibility of a number of the species. It appears unlikely that further testing of them will be necessary. Studies of seedling bushes at Bell indicated that in most species the bushes hybridize readily with neighboring species and that such hybrids are, in general, susceptible, probably because the number of susceptible species exceeds the number of resistant ones. However, even in lots of seed from such immune species as Berberis thunbergii and B. julianae, susceptible plants were found. These plants usually differed from the other seedlings in morphological characters also. This is further indication of the fact that seedlings probably will not be truly representative of the type species, either in morphological characters or rust resistance.

Rust observations in Texas and Mexico.--Observations in northern Mexico from April 21 to 25 disclosed that there is more stem rust this year than in 1935 and 1936. By the middle of May stem rust had been found on wheat as far north as northern Oklahoma. Although there was a considerable amount

in some wheat-growing areas of Texas, the wheat was approaching maturity so rapidly that it seemed doubtful whether appreciable damage would be done. At the same time there were only traces of stem rust in occasional fields of oats in Texas.

Rust has appeared in Kansas wheat fields.--By the end of May black stem rust could be found in many localities in eastern Kansas, western Missouri, and southern Nebraska. The severity of infection varies considerably in different localities and in different fields, soft wheats in general being most heavily infected. By June 9 there were traces of rust as far north as Sioux City, Iowa. The extent of its future development in the spring wheat region will depend largely on weather conditions.

Other rust notes.--Infection on barberries appeared somewhat late this spring. Bushes became rusted in April in Virginia and West Virginia, and during May in Ohio, Indiana, Michigan, Wisconsin, Missouri, Iowa, and Minnesota. Collections of aecial material from barberries have been obtained from six States, and efforts will be made to identify as many of them as possible. Collections of stem rust of wheat from Mexico and Texas also are being determined. Now in process of identification in the greenhouse at St. Paul, Minn., are 65 or 70 uredial collections and 17 aecial collections. Studies of teliospores of Puccinia graminis during the last fall and winter again indicate that high temperatures during the summer are usually injurious to the spores. Teliospores of P. graminis tritici obtained late last fall from Texas and Oklahoma and early this spring from Missouri did not germinate, whereas collections from Colorado, Kansas, and Minnesota germinated readily. Many of the collections from Minnesota, however, did not appear to germinate as readily and abundantly as in previous years. The sporidia produced by the germinating teliospores will not develop on grain, but only on barberry leaves.

Seasonal Ribes eradication operations started in the North.--During May the number of men employed under the emergency allotments in blister rust control was increased from 1,760 to 2,927. Ribes-eradication work was begun for the spring in all the northern regions and was continued in the southern Appalachian territory, where it had been in progress all winter. Winter work on blister rust control in the Northern States consisted of pine surveys and maps, disease surveys, and canker removal on ornamental and valuable pines on Federal property, such as national parks.

Eradication of European black currant being rechecked in California.--The locations in which European black currants were found a number of years ago in California are now being rechecked. Most of the bushes located thus far have been found on properties where the owners were originally reluctant to part with them and it appears that in some cases there has been either sprouting or replanting of bushes previously dug up.

New pine infections in Wisconsin.--Blister rust cankers on white pine were found for the first time in May in LaCrosse and Brown Counties, Wis. Ribes infection had been reported in these counties in other years. Blister rust has now been reported on white pines from 43 of 71 counties in the State.

Blister rust control under W. P. A. and E. C. W. projects in the Northeast.--Plans for blister rust control in the Northeastern States include the employment of an average of 823 laborers from relief rolls on Ribes-eradication work during May and June. In addition, the E. C. W. program from May to September provides 232,505 man-days of labor from a total of 123 C. C. C. camps for similar work in 264 townships. In New Hampshire and Maine local control projects will be conducted in 119 cooperating townships, as a result of town appropriations totaling \$25,625.

Ribes-eradication training school in Vermont.--During the week of May 3, a training school for E. C. W. technical foremen (supervisors) in blister rust control was held at the Thetford, Vt., C. C. C. camp. The 13 men in attendance were given comprehensive instructions in the various phases of control work in order that they might later supervise labor from their respective camps assigned to Ribes-eradication work.

Nursery sanitation.--Blister rust sanitation projects around white pine nurseries were in operation in all the Northeastern States and in a number of Middle Western, Western, and Southern States. This work maintains Ribes-free zones around the nurseries and assures the production of white pine stock which is free from blister rust infection.

COTTON INSECT INVESTIGATIONS

Humidity limits duration of long-cycle pink bollworm larvae.--Studies of the ecological factors limiting the formation and duration of the long-cycle larvae of the pink bollworm have been continued by L. C. Fife at Mayaguez, P. R. In March open cotton bolls containing an estimated quantity of long-cycle larvae were placed on the soil surface under screened cages. In the examinations in April and May, 15.6 percent of the larvae were alive and had not pupated after 36 days, and 19 percent after 68 days. Many dead larvae were found, thought to have been killed by high temperatures, on the soil surface. Laboratory experiments were started to determine the effect of contact moisture on long-cycle larvae in order to evaluate the effect of rainfall on the duration of the resting stage under field conditions. Long-cycle larvae were removed from bolls and allowed to spin up between discs of paper and the bottoms of petri dishes. After they had spun up, the petri dishes were divided into four lots. One lot was moistened daily, another weekly, the third biweekly, and the fourth was left dry as checks. Water was poured into the treated dishes for 3 minutes, then they were allowed to drain. The paper remained wet for about 8 hours but the water did not penetrate the cocoons. Very little difference in the percentage of pupation occurred in the first 30 days of treatment, but after 72 days 70 percent of the larvae moistened daily, 41 percent of those moistened weekly, 40 percent of those moistened every 2 weeks, and 27 percent of those left dry had pupated. In other tests, where larvae were permitted to spin up in absorbent cotton and then kept moistened to different degrees of humidity, pupation was greatly accelerated with increases in humidity. When kept continuously moist and near 100-percent humidity, pupation was completed within 45 days. These results indicate that humidity is the important factor in limiting the duration of the long-cycle larvae under tropical conditions, and

that in the field, under conditions of heavy rainfall, pupation and emergence of all long-cycle larvae would be completed in from 45 to 60 days. They also indicate the possibility of practical use in reducing the pink bollworm damage by adjusting the planting date to the distribution of rainfall.

Beet army worm on cotton.--T. P. Cassidy and T. C. Barber report that Laphygma exigua Hbn. again caused considerable damage to cotton in Arizona this year. One of the large cotton growers in the Buckeye district employed two men for the greater part of May to patrol the fields and immediately dust small areas with hand guns. He also bought an 8-row power duster for use where large areas were involved. Calcium arsenate, paris green and lime (1 part to 8 and 10 parts of lime) as dusts, and paris green, 2 pounds in 50 gallons of water, were used. All of these treatments were fairly effective when the worms were small, but in no case were all of the worms killed and the control by arsenicals was not entirely satisfactory. The best control was obtained by immediate irrigation of the cotton as soon as the worms were detected. The irrigation should be applied down the rows and not in the middles, in order to surround and submerge the plants. The water washes many of the worms from the plants, seals many of them under the surface of the soil where they go between feedings, and also revives some of the injured seedlings that would otherwise die. Delay in thinning the cotton plants until danger of attack is past has also aided in obtaining a better stand.

Presquare poisoning for boll weevil.--K. P. Ewing and R. L. McGarr, Port Lavaca, Tex., report regarding presquare boll weevil control tests conducted this year in the Lavaca River bottom near Edna, Tex. Three fields were dusted while cotton was in the presquare stage with from 6 to 8.3 pounds of calcium arsenate per acre, and one field was mopped with from 2 to 2½ gallons of calcium arsenate-molasses mixture (1 pound calcium arsenate, 1 gallon molasses, and 1 gallon water) per acre. Besides the three three-plot experiments, three entire fields of cotton were dusted with calcium arsenate, one entire field was mopped, and one field left as an untreated check. Before treatment all plots and fields were infested with boll weevils, the numbers ranging from 3 to 33 per 1,000 plants examined. Two weeks after the poison applications were made, less than 1 percent of the squares were infested in eight of the poisoned plots and fields, in one field where calcium arsenate dust was used less than 3 percent of the squares were infested, and in one plot with the same treatment less than 9 percent were infested, whereas in the untreated 12-acre check field the infestation was 50 percent, and in the three 1-acre check plots the infestations were 25, 31, and 46 percent. This indicates remarkable results from the presquare poison treatments this year in southeastern Texas.

Balloons aid in determining the effect of wind on movement of cotton flea hopper.--Mr. Ewing also reports that through the cooperation of F. L. Thomas, of the Texas Agricultural Experiment Station, 4,300 balloons were released in May for the purpose of obtaining information regarding the possible effects winds may have on the movement of insects, particularly the cotton flea hopper (Psallus seriatus Reut.). The balloons and hydrogen for

inflating them were supplied by the Texas Agricultural Experiment Station and the serially numbered franked tags were supplied by this Bureau. The 20 counties from which releases were made were selected because they contained large areas of horsemint and croton, the two principal host plants of the flea hopper. From the 1,623 balloons that had been released prior to June 4 in 10 counties around Port Lavaca, 82 tags had been returned by that date. One balloon, released on June 2 at Hallettsville, Tex., was recovered the next day at Waldo, Ark., a distance of approximately 375 miles. Another, released at Hallettsville at 11:48 a.m. on May 26, was recovered at 5:00 p.m. the same day at Pennington, near Crockett, Tex., after traveling 155 miles in 5 hours and 12 minutes, or 30 miles per hour. Although it is still too early to even estimate the percentage of recoveries that will be made, the average to June 4 from releases made on various dates from May 14 to June 2 was 5.05 percent. The largest number of recoveries from any series of releases made on 1 day from the same location was 14, or 28 percent of the 50 balloons released at Columbus in Colorado County on May 19.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Wild-cotton eradication.--The eradication of wild cotton in southern Florida went forward satisfactorily during May. The work was curtailed somewhat because of the necessity of conforming with certain regulations changing some of the crews from an exemption basis to a certified-relief status at security wages and hours. There was also a considerable reduction in the number of laborers used, as the camp at Cape Sable was discontinued the first of the month. A small crew was also discontinued on Marathon Key. At Cape Sable a few small sections that had not been worked were completed by a small crew on May 14. A first clean-up was made on 83 acres, on which 265 mature and 684 seedling plants were destroyed. The recleaning covered 1,948 acres and resulted in the destruction of 69 mature, 80,813 seedling, and 593 sprout plants. At least five new locations of wild cotton were destroyed, this cotton having been located in the autogiro survey. It was a comparatively simple matter for the crews to reach this cotton and destroy it. The eradication program is now getting in very good condition for this season of the year. As crews are discontinued, the trucks and other equipment used are being cleaned and repaired as rapidly as possible, in order to preserve and have them for next season's work.

Thurberia-plant eradication.--The eradication of Thurberia plants in the Santa Catalina Mountains of southern Arizona has also continued to make satisfactory progress. During the month 2,040 acres were covered and 3,665 Thurberia plants destroyed. The small number of plants destroyed is due to the fact that some of the higher sections were worked during the first part of the month. There was little likelihood that Thurberia plants would be found in such places but, in order to cover the territory thoroughly, they had to be worked. Two small forest fires were discovered and put out by members of the crew, who had the fires well in hand by the time the forest ranger arrived.

Laboratory inspection.--Laboratory inspection has been carried on as usual at San Antonio and at practically all of the field stations. The results were negative for all material originating outside of regulated areas; however, one or two larvae were found in material collected in the El Paso Valley.

The situation in the Big Bend.--Early in the season a few farmers in the Big Bend section of Texas indicated that they did not intend to observe the uniform planting date of April 15, or later. In order to be successful, the special control program, which has been in effect since the fall of 1932, must be observed unanimously and, as a few intended to break over, the program was withdrawn in Presidio County. The first cotton was planted on March 17 and plantings continued until May 26. As a result, the oldest cotton is now beginning to fruit, while the latest cotton is only a few inches high. There are also a few stub plants, or new growth put out from last year's roots, on nearly every farm. The latter part of the month a good many infested small squares could be found on these stub plants. It would therefore appear that the worm population will build up in this early planted and stub cotton and result in a heavy infestation this fall unless some unusual condition should arise. In Brewster County the control program is being wholeheartedly observed; however, there is only a small acreage planted to cotton. The control program briefly consists in clean-up of fields and premises in the fall after picking is completed; a uniform planting date of April 15 or later in the spring, so that the majority of moths will have emerged before the cotton begins fruiting; and the use of small trap plots to trap the moths emerging later. A small plot of cotton was planted in Brewster County but, inasmuch as the field cotton was planted considerably after April 15, it was not considered advisable to use the plot. There is always danger of some fruit being overlooked, allowing worms to develop; consequently the plot was destroyed on May 20.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Factors governing curly top infection.--In analyzing the results of a study, made in south-central Idaho, of the beet leafhopper and the curly top disease during the 7-year period 1930-36, J. R. Douglass and his associates at the Twin Falls, Idaho, laboratory, conclude that early spring movements of beet leafhoppers were followed by rapid and widespread curly top infection, resulting in low yields of sugar beets, whereas late spring movements were followed by seasons in which sugar beets escaped serious curly top infection and produced good average yields. The initial infection of curly top appeared usually in the western part of the territory studied and spread from west to east. The percentage of curly top infection of sugar beets in the 1935 and 1936 seasons, during which resistant strains of sugar beets were planted, paralleled that found in the susceptible strains grown during the preceding years 1930-34, through the early part of the season so that a high percentage of total infection was attained whenever leafhopper populations were high, but the resistant strains displayed a marked tendency to recover from the disease during the latter half of the summer, so that good average yields were produced in the fall. A comparison of the acreages of sugar beets planted, thinned, abandoned, and harvested,

and the resultant yields per acre, during seasons of high curly top infection with those of low infection, showed that much abandonment of sugar beet acreage occurred during those years when the curly top disease appeared early and spread rapidly, and that low tonnages of beets resulted; whereas very little abandonment occurred in years when curly top infection was late and slow in spreading, and that good average yields were obtained under these conditions. In comparing the average yields of sugar beets in 1935, during which resistant strains were planted, with those of 1930 and 1932, during which susceptible strains were grown, it was shown that high curly top infection reduced the average yield of susceptible beets in 1930 to a point below the margin of profit, and that low curly top infection allowed the production of a highly satisfactory average yield in the same strains of sugar beets in 1932; also, that the resistant strains of sugar beets produced a good average yield in 1935, despite a high infection early in the season.

Insecticides promising against strawberry weevil.--The results of experiments performed by W. A. Thomas at Chadbourn, N. C., against the strawberry weevil indicated that when the weevils cut as many as 15 percent of the flower buds a significant degree of control can be obtained by making from two to three applications of undiluted dusting sulphur, a dust mixture containing 0.5 percent rotenone, with clay as a diluent, or a dust mixture composed of calcium arsenate and finely ground dusting sulphur (1-5) applied at weekly or 10-day intervals during the period when the flower buds are being cut by the weevils. Very thorough coverage of the plants with any of these dust mixtures appears to be essential for effective results. For the duration of the insecticide applications, there were significantly fewer buds cut on the plots receiving the calcium arsenate-sulphur dust mixture than on any of the other plots. In the number of marketable berries produced the plots receiving the undiluted sulphur, the 0.5 percent rotenone, or the calcium arsenate-sulphur dust mixture were significantly better than the untreated check plots. Undiluted sulphur gave slightly better results than either of the dust mixtures. In the weight of marketable strawberries produced the undiluted sulphur and the dust mixture containing 0.5 percent rotenone were significantly better than the check. The calcium arsenate-sulphur dust mixture produced a significantly greater number of cull berries than were produced on the untreated check plots and the weight of the cull berries on these plots was significantly greater than on any of the other plots receiving insecticidal treatment..

Tomato fruitworm fails to survive winter in Utah.--H. E. Dorst, of the Logan, Utah, laboratory, reports that examinations of overwintering cages of *Heliothis obsoleta* Fab. at Logan, Hooper, and Farmington, Utah, have indicated that none of the *H. obsoleta* pupae survived the winter of 1936-37 in that locality. A total of 75 larvae were placed in cages at each of these localities during the fall of 1936 and supplied with sufficient food to enable them to reach maturity before entering the soil. These larvae were given an opportunity to overwinter under very favorable conditions.

High survival of Mexican bean beetle in Ohio and Virginia.--H. C. Mason, of the Columbus, Ohio, laboratory, reports that at the close of May, the data obtained from Mexican bean beetle hibernation cages indicated an average

of 32.6 percent survival, and similar data obtained by L. W. Brannon, of the Norfolk, Va., laboratory, indicated a survival of approximately 24 percent in eastern Virginia. This survival of the Mexican bean beetle is much higher than has occurred during recent years.

Handpicking indicated as an effective control of harlequin bug under special conditions.--L. W. Brannon, of the Norfolk, Va., laboratory, reports that the results of an experiment conducted at Norfolk to determine the effectiveness of handpicking overwintering adult harlequin bugs (Murgantia histrionica Hahn.) on seed kale as a means of preventing an infestation of this pest on spring cabbage indicate that this method, under the conditions stated, gives practical results. In the course of this experiment an average of 928 M. histrionica adults per acre were removed from the seed kale during the period extending from April 14 to June 2, 1937.

Crude naphthalene fairly effective against wireworms at low soil temperatures.--According to a report submitted by R. S. Lehman, of the Walla Walla, Wash., laboratory, recent field tests performed with crude naphthalene as a soil fumigant for wireworms, principally the sugar beet wireworm (Limonius californicus Mann.) and the Pacific coast wireworm (Limonius canus Lec.), at Prosser and Walla Walla, have indicated that fairly successful results may be obtained by this method, even when the soil temperatures to a depth of 12 inches range from 65° to 67° F. Concentrations of 500 and 800 pounds of crude naphthalene per acre were used. At Prosser the percentage of mortality obtained with these concentrations was 93.5 and 84.2 percent, respectively, whereas at Walla Walla mortalities of 70.3 and 85.7 percent, respectively, occurred.

INSECTS AFFECTING MAN AND ANIMALS

Effects of certain infusions on hatching of mosquito eggs.--H. H. Stage, of the Portland, Oreg., laboratory, has conducted tests to obtain information on the substance or substances that must be present in water before eggs of Aedes vexans Meig. and A. aldrichi Dyar and Knab will hatch. Several thousand eggs of these species were recovered from soil taken in the field. It was found that pure tap water, vitamin B infusion, and pantothenic acid induced no hatching, while infusions of dead or green leaves, liver, and oats induced satisfactory hatches.

Mosquito control in catch basins.--W. V. King, of the Orlando, Fla., laboratory, reports the following: "The Orlando sanitary department requested advice as to a larvicide to use in place of oil in street catch basins that emptied directly into the numerous small lakes in the city, as it was believed that the oil used in previous years (consisting of excessive quantities of waste crank-case oil) had been injurious to the water fowl, and especially so to the eggs of swans. Upon the suggestion of T. E. McNeel, a mixture of paris green and water was tried on some of these basins and appeared to be so effective that all of the basins in the city (more than 1,000 in number) were given similar applications on two successive weeks. Check examinations in 27 basins, made by Mr. McNeel about 24 hours after

treatment, showed 100 percent mortality in 25 of the basins and an average of more than 99 percent for all of them. The paris green was used at the rate of about 1 pound per 100 basins. This method of treatment proved to be somewhat more rapid than oiling; the principal drawback seemed to be that mosquito breeding was resumed almost immediately, the paris green having no effect on the eggs or as a deterrent to oviposition."

Screwworm in Arizona.--C. C. Deonier, Uvalde, Tex., reports that Cochliomyia americana Cushing and Patton has gained entrance to Arizona from Mexico by migration. It is now well established in Pima and Santa Cruz Counties. There are indications that it entered the State earlier in the spring; also, it is probable that Cochise County became infested at the same time as Santa Cruz and Pima Counties.

Screwworm incidence.--A. W. Lindquist, Uvalde, Tex., reports that the number of screwworm cases has increased steadily throughout the month on most ranches near Uvalde. This increase has progressed under very dry conditions with temperatures 1.4° F. (=78°) above average, and winds that were strong and continuous. One man reported 200 cases in 1,000 head of sheep and goats during April and May. Many of the cases in sheep and goats were caused by eating prickly pear.

Houseflies breeding in waste lettuce.--Mr. Deonier also reports that a tremendous population of houseflies has bred up in waste lettuce in the fields of the Salt River district and at Yuma.

FOREIGN PARASITE INTRODUCTION

Hessian fly parasites from France.--During April and May 3 shipments of Platygaster pleuron Walk., totaling 1,039 adults, and 2 of Trichasis remulus Walk., comprising 855 adults, were forwarded from St. Cloud for colonization in the United States.

Sawfly parasite material to Canada.--Continuing work in Japan, in cooperation with the Canadian Department of Agriculture, R. W. Burrell reports the shipment of 138,000 field-collected cocoons of Diprion nipponica Roh. to the Belleville, Ontario, laboratory. This material was collected largely near Mt. Fuji, where the pest appears to be building up after a period of relative scarcity.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Seventeen larvae and five puparia of the West Indian fruit fly (Anastrepha acidusa Walk.) were collected on December 1, 1936, in 20 grapefruits in the field at Manati, P. R. Forty-three living larvae of the Mediterranean fruit fly (Ceratitis capitata Wied.) were intercepted at New York on March 8 in 17 loquat (Eriobotrya japonica) fruits in baggage from Bermuda. Two living specimens of the pink bollworm (Pectinophora gossypiella Saund.) were taken at Houston, Tex., on February 25 in seed cotton in the mail from Turkey. A living larva of the bruchid Pachymerus nucleorum F. arrived at San Francisco on February 17 in

babassu (Orbignya speciosa) nuts in cargo from Brazil. A living adult of the scarabaeid Anomala attenuata Bates was found at Galveston, Tex., on August 17, 1936, with banana debris in cargo from Honduras. The scale insect Aspidiotus (Aonidiella) orientalis (Newst.) was taken at Baltimore on March 3 on shisham (Dalbergia sissoo) seed in the mail from India. The citrus blackfly (Aleurocanthus woglumi Ashby) was intercepted at Miami, Fla., on March 24 on an orange leaf in baggage from the Bahamas. Two living larvae of the olethreutid Crociosema plebiana Zell. arrived at Laredo, Tex., on February 12 and 17 in okra in cargo from Mexico. Living specimens of the scale insect Chionaspis yanonensis Kuw. were intercepted at San Pedro, Calif., on February 12 on oranges in ship's stores from Japan. H. Morrison reports that this species also goes under the generic name Prontaspis and that there is no record thus far of its occurrence in the United States.

Interesting bruchid from Turkey.--A living adult of Bruchus hamatus Miller was intercepted at Washington, D. C., on January 15 in an unknown seed in baggage from Turkey. H. S. Barber reports as follows: "This is a very interesting addition to our collection, no sample having been available until now. It is one of the least known species of the genus and its host plant is unknown." On January 23 another living adult of this bruchid was taken at Washington, D. C., with seed of Vicia sp. in baggage from Turkey.

Weevil taken on pineapple.--A living adult of Conotrachelus leuco-phaeatus Fahr. was intercepted at Eagle Pass, Tex., on May 29, 1936, on a pineapple in cargo from Mexico. L. L. Buchanan states that this species is reported to breed in the stem of snow-on-the-mountain (Euphorbia marginata) and is recorded in the stem of Amaranthus sp. It ranges from Mexico and Texas northeastward as far as New Jersey.

Jamaican carries extensive food supply.--On the S. S. Ulan on May 13, Inspector J. H. Painter at New York intercepted from the baggage of one Jamaican passenger 25 pounds of yams from which 7 insect interceptions were taken; 85 mangoes infested with scale insects; 7 sweetpotatoes; and 52 nodes of sugarcane.

Pathological interceptions of interest.--N. Rex Hunt, who prepares the notes on pathological interceptions, is temporarily incapacitated by injuries resulting from an automobile accident. Mention of some of the more important interceptions will, therefore, be deferred for a time. Ditylenchus dipsaci (De Man) Filipjev was intercepted in Hymenocallis calathina from Holland at the Inspection House in mail on January 27. This represents our first interception of D. dipsaci in this host. Helminthosporium sp. and Phyllachora sp. on Polytrias amaura (lucknow grass, used as bedding and food for animals) from India, found at Savannah on March 25, constitute our first records for this host from India. The first interception of Hendersonia grossulariae Oudem on Ribes sp. from Norway was made March 5 at San Francisco from material found in mail. Heterodera marioni (Cornu) Goodey was found on Aloe verecunda and Drimia haworthioides from the Union of South Africa at

Washington on May 6. The A. verecunda and Drimia add a new species and genus respectively to the known hosts of this nema. The same nema was found in lettuce in stores from Haiti on March 2 at New York, thereby adding Haiti to the list of countries in which this pest occurs. Phaeochora neowashingtoniae (Shear) Theiss and Syd. was found on March 16 on palm leaf from Mexico in baggage at San Ysidro, Calif. This is a new interception record. Phyllachora sp. on Cymbopogon citratus from St. Vincent, British West Indies, found in mail at New York on January 26, is our first interception record for this host from that island. Puccinia absinthii D. C. was intercepted for the first time on leaf of Artemesia absinthium at New York on March 25, in mail from France. Puccinia versicolor Diet. and Holw. was intercepted on Andropogon contortus at El Paso from Mexico on March 11, our first interception record. Another new interception record for material from Argentina was made on May 19 at Philadelphia by the finding of Septoria petroselini Desm. on parsley. Uredo ignava Arth. was found on a leaf of Bambusa sp. (prob. B. vulgaris) in mail from Tobago, British West Indies, at New York on March 5, another new interception record.

DOMESTIC PLANT QUARANTINES

Phony peach inspection.--Field work has been concentrated since the beginning of the season on the inspection of environs of peach-growing nurseries in the infected States, as the major activity in the control of the disease. Orchard inspection will be started on the completion of nursery inspections. Under a well-organized force of over 100 Federal inspectors and approximately 20 State inspectors, inspection of nursery environs has been completed in Alabama and Mississippi and is in progress in Georgia, Tennessee, Texas, and Arkansas. To the close of May the environs of 118 nurseries covering 6,024 properties had been inspected and 88 properties were found infected. This type of inspection will be extended in June to Illinois, Missouri, Oklahoma, North Carolina, South Carolina, and Louisiana and during the season to the infected counties of Indiana, Kentucky, Maryland, and Pennsylvania.

State quarantines on phony peach disease standardized.--The quarantine committee of the Southern Plant Board in conference at Birmingham, Ala., on April 17 approved a draft of a phony peach disease quarantine which they recommended for uniform adoption by the various infected States. This standardized quarantine was accepted, we are informed, by officers of all States attending the conference, as well as certain other infected States. This quarantine requires certification as a condition of movement of host plants from the infected areas into, within, or from the State of origin. Such action, if taken by all infected States, affords equal protection to all peach-growing States and removes the necessity for quarantine action on the part of noninfected States. It also protects the accomplishments of the control program against reinfection because of intrastate or interstate shipments of exposed nursery stock to infected areas. The requirement of a disease-free zone of 1 mile around nurseries is retained, while the old provision for culling nursery stock for the peach borer, as an alternative condition of certification, is removed. Supplemental regulations have also been

issued by the States of Georgia, Alabama, and Mississippi, declaring the phony peach disease a public nuisance. These measures greatly strengthen the control program, assure nurserymen of protection against diseased trees on neighboring properties, and simplify the problem of prompt removal of infected trees in orchards and home plantings in the course of regular inspection.

Destroying diseased trees effects control of peach mosaic.--Rapid and consistent reduction of the peach mosaic disease in the infected area in Mesa County, Colo., has been effected as a result of the prompt removal of all diseased trees during the last 2 years. Similar results are being accomplished in Utah. In the first round of Colorado inspection this season, the new cases numbered less than one-third those of last year and approximately one-ninth those of 2 years ago. Peach growers at Palisade, Colo., celebrated the accomplishments to date at a recent banquet and pledged themselves to the continuation of the campaign to a successful finish. In California the situation is less favorable where the 1936 inspection work was not begun until July, where only 45 percent of the diseased trees were removed and then after seasonal spread of the disease may have occurred. The 1937 inspections in that State show an increase of infection of from 50 to 500 percent over last year. Pending litigation is retarding eradication; however, cooperation under the circumstances is satisfactory and the outlook is encouraging. A force of 105 Federal inspectors and 28 State inspectors is at work in the infected States of Texas, New Mexico, Arizona, California, Colorado, and Utah. Infections around the affected States are, in the main, definitely localized and not generally distributed in any area. This, in view of the known rapidity of spread of the disease, indicates the infections were introduced rather recently, and lends encouragement to the practicability of eradication.

Citrus canker inspection.--Nearly 65,000 properties in 63 counties of 5 States have been inspected for citrus canker during the period from August 1935 to May 1937, such work having been conducted in the entire citrus-producing area of Texas, Louisiana, Alabama, and Mississippi. Over 26 million trees have been inspected. Worthless citrus trees numbering over 18 million have been removed from over 11,000 properties in these States. While several recurring infections of citrus canker have been found in recent months occurring on seedlings growing from sites where infected trees were removed during the last 2 years, the last new infection was located in Texas in August 1936 and only one new case has been found in Louisiana in this calendar year. A recent report of the abandoned tree-eradication project of the lower Rio Grande Valley in Texas, states that 98 percent of the abandoned citrus nursery stock which was growing in Cameron, Hidalgo, and Willacy Counties at the beginning of the work in 1935 has been removed. The owners had abandoned these nurseries, owing to the drought and depression of recent years and the stock was of no value. The eradication work has minimized the danger of outbreak of citrus canker and has given employment to 531 persons on relief. The project is now completed.

Transit inspection.--Inspectors report a heavier movement of nursery stock last spring than in recent years, with large numbers of shipments from

greenhouses in the Ohio area recently brought under the regulations of the Japanese beetle quarantine. During the season transit inspection was carried on at 16 of the more important transfer centers throughout the United States. The regular inspection force was augmented by the assignment of 22 inspectors from other divisions of the Bureau and 15 State inspectors. This action, particularly by the several States, indicates considerable stimulation of interest in the value of transit inspection. Approximately 450 violations of Federal domestic quarantines were intercepted in May and approximately 1,450 in the period from January to May, inclusive. One of the shipments which was intercepted and returned by the New York inspectors contained Japanese beetle larvae. A transit inspection office has been established at Indianapolis, Room 425 of the Post Office and Courthouse Building having been assigned for the purpose. Work at this station is conducted on a part-time basis by W. R. Walton, Jr.

Inspection of five-leafed-pine nurseries.--Inspection of zones surrounding nurseries growing five-leafed pines for interstate shipment from blister-rust infected States is approaching completion in the Middle West and the Eastern States and is in progress in the Far West. Such inspection for any remaining wild or cultivated Ribes plants has followed closely the eradication work conducted under the supervision of the Division of Plant Disease Control, and is done as soon as the Ribes foliage leafs out in the respective regions before competing vegetation makes it difficult to find the currant and gooseberry plants. Seventeen Federal nurseries and nine State nurseries have applied for shipping permits. The Soil Conservation Service has eight such nurseries in six infected States and the Forest Service has nine in seven infected States. Commercial nurseries have applied for permits to ship pines from 16 States covering a range from Maine to Virginia and from the Middle Atlantic States west to Iowa and Minnesota.

Public conference on black stem rust.--A public conference is to be held on July 14 at 10 a. m. in the Department Auditorium to consider the advisability of extending the Federal grain-rust quarantine to include Missouri, Pennsylvania, Virginia, and West Virginia in the States for which permits must be obtained for shipping certain species of barberry and Mahonia to destinations therein. Under a recent revision of Circular B. E. P. Q. 385, Berberis ottawensis was removed from the permitted list of barberries.

INSECTICIDE INVESTIGATIONS

New form of paris green.--On May 11, 1937, the United States Patent Office granted F. E. Dearborn, of the Division of Insecticide Investigations, Patent No. 2030004, covering certain new compounds containing copper, arsenic, and organic acids. These new compounds are closely related to paris green in that the acetic acid of paris green is replaced by an unsaturated acid such as crotonic, oleic, and erucic. These new compounds are greenish in color. They are superior to ordinary paris green in that the water-soluble arsenic content is very low.

Arsenates of manganese.--All of the available information concerning the occurrence in nature, chemistry, methods of manufacturing, chemical and physical properties, and use as insecticides, of the various arsenates of

manganese has been collected by F. E. Dearborn, of the Division of Insecticide Investigations, and published in mimeographed form as publication E-403. Although none of the manganese arsenates has come into extensive use as insecticides, this compilation will be helpful to those interested in testing new arsenicals.

BEE CULTURE

European foulbrood fails to recur in Caucasian and Carniolan colonies.--C. E. Burnside, of the Beltsville, Md., laboratory, reports that during May 1936, four colonies of Caucasian, four of Carniolan, and four of common black bees were inoculated with European foulbrood and about the same degree of infection resulted in all the colonies. Infection soon disappeared, however, from the Caucasian and Carniolan colonies but continued throughout the season in the common black bees. During spring brood rearing in 1937 the disease recurred in all the colonies of common black bees but did not recur in any of the Caucasian or Carniolan colonies. As European foulbrood usually recurs year after year in colonies of nonresistant bees, the fact that there was not a single recurrence among the Caucasian or Carniolan colonies at least indicates that these races show superiority, so far as resistance to European foulbrood is concerned.

Methods for standardized survival tests for adult honeybees.--A. W. Woodrow, of the Intermountain Bee Culture Field Laboratory, Laramie, Wyo., reports as follows: "It has been found that adult bees kept in cages in especially constructed cabinets and fed various foods under controlled temperature and relative humidity conditions, live from two to five times as long at 20-percent relative humidity as at 92-percent relative humidity, the temperature being 84.5° F., when salt solutions and wicks are used in the cabinets to control the relative humidity in uncirculated air. Sucrose solutions are more favorable to length of life than honey under these conditions. When water is available the bees live longer in the case of both foods. When a slow-moving fan is used to circulate the air in the cabinets, relative humidities of from 20 to 25 percent are almost as unfavorable for life as high relative humidities at the above temperature, and the bees live only a short time on normal honey, unless water is available. This difference is believed to be due to the large differences in the evaporation rate between nearly stagnant and circulated air. At all relative humidities the length of life seems shorter in circulated air than in nearly stagnant air."

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Second record for an anobiid injurious to flooring.--In 1934 W. S. Fisher described as a new genus and new species *Platybregmus canadensis*, the specimens on which the description was based having been obtained at Arthur, Ontario, from maple flooring which was reported to be badly infested. Recently R. W. Leiby, of Cornell University, submitted for identification specimens from New York State (specific locality not mentioned), which have been determined by Mr. Fisher as the above species. The beetles were said to have ruined a floor in a house, being so abundant that half a cupful could be collected daily.

Rediscovery of a Fabrician species of Lepidoptera.--A small moth taken on grapefruit at Bayamon, P. R., and submitted for determination by the Division of Foreign Plant Quarantines, has been identified by August Busck as Tinea minutella F. This is a most interesting specimen, as it apparently represents the first capture of a moth belonging to this species since Fabricius published his original description in 1794 under the name Alucita minutella. The type was recorded as from the West Indies without more specific indication of locality.

An interesting lepidopterous record from the Olympic Mountains of Washington.--Annette F. Braun, of Cincinnati, Ohio, recently submitted to J. F. G. Clarke for determination an Agonopterix which she had reared in September 1936 from Erigeron sp. When the male genitalia were examined it became immediately apparent from the unique character of these organs that the specimens were Agonopterix arnicella Walsingham. In 1871 Lord Walsingham reared five specimens of this species taken on Mt. Shasta, Calif., supposedly from Arnica angustifolia, these constituting his type series. Two males of this series are in the U. S. National Museum collection. Sixty-five years have elapsed since the species was first discovered. One of Dr. Braun's specimens is a female, the only female of the species known in this country.

Indication of host association in the ichneumonid genus Hymenopharsalia.--The recent rearing of specimens of Hymenopharsalia foutsii Cushman from leaves of sumac infested by two lepidopterous leaf rollers, Episimus argutus Clemens and Gelechia (Pseudochelaria) walsinghami Dietz, furnishes the first host record for any member of this anomalous ichneumonid genus. The material was collected in September 1936 at Germantown, Md., by Janet A. Breeden and Nettie E. Crocker, of this Bureau, and the insects, both hosts and parasite, emerged on May 19, 1937.

First female specimens of an interesting cicadellid.--Two females of Krisna insularis Oman have been received for determination from Luis F. Martorell, who collected them on El Yunque, Luquillo Forest, P. R. These specimens represent the first known record of the female sex of the species, which was described in 1936 from two males taken at the same locality and representing the first known American specimens of the genus.

Additions to the reference collections at the Museum.--William Schaus reports that among recent gifts of exotic Lepidoptera received, special mention should be made of approximately 100 species and forms of neotropical Sphingidae presented by B. Preston Clark, of Boston, Mass. Through the generosity of A. da Costa Lima, of Rio de Janeiro, Brazil, paratypes of a number of fruit flies of the genus Anastrepha not previously represented in our material were received for the collections of the National Museum. These will assist materially in the revision of this important group, which is now in progress.

On the preservation of insect larvae.--A large part of the larval material submitted by various Bureau units and individuals for determination, for illustration, or for permanent preservation in the collections, is in very bad condition when received. Accordingly, it seems desirable to circulate, by means of the News Letter, certain simple directions for the preservation of such material. These directions are as follows:

All larvae should be killed in boiling water. In Diptera and Hymenoptera (except sawflies) the larvae should be dropped into the water after it has been removed from the flame and should remain in it from 3 to 5 minutes, depending on their size. For Lepidoptera, Coleoptera, and sawflies, the larvae should be dropped into the boiling water and allowed to boil vigorously for 1 minute or longer (as long as 5 minutes for the larger Lepidoptera). After having been killed and fixed by this means, the larvae should be transferred to vials completely filled with alcohol of not less than 75-percent strength, 95 percent being preferred for the larger Lepidoptera. Only new and well-fitting corks should be used. The following of this simple procedure will insure the satisfactory preservation of larval material.

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BUREAU OF
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NEWS LETTER

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August 1, 1937

F. A. REYNOLDS RETIRES

Frank A. Reynolds, auditor in the fiscal and budget section of the Bureau, retired on June 30, 1937, on account of disability. Mr. Reynolds entered the service of the Department in 1902 as a clerk in the Bureau of Soils and came to the Bureau of Entomology in 1925. Since that time he has been engaged in auditing work in the Bureau of Entomology and the present Bureau of Entomology and Plant Quarantine. Throughout his service his official associates found him to be not only a conscientious and efficient auditor but one whose broad interests and sympathies contributed greatly to the morale of his organization.

A NEW WEEVIL IN THE SOUTHEAST

Last summer a new weevil was found in Covington County, Ala., and Walton and Okaloosa Counties, Fla., established over an area of probably not more than 35 square miles. This weevil was determined as Naupactus leucoloma Boh., a native of Argentina, Chile, and Uruguay. It has also been introduced into Australia. In the United States this insect has already destroyed fields of peanuts, cotton, corn, velvetbeans, Irish potatoes, and sweetpotatoes, and is known to attack a wide variety of other garden crops. It does most of its damage in the larval stage where the grubs feed extensively on the roots of plants. The adult beetles, which cannot fly and are, so far as is known, all females, come out of the ground in enormous numbers in late June and feed on the foliage of a variety of plants before they commence to deposit eggs in the soil. Forty Federal and State inspectors are now in the infested area carefully scouting to determine the limits of distribution. Repressive measures, which consist of hand picking, poisoning, and constructing trench barriers to prevent spread, are being carried on.

NICARAGUAN LOCUST TAX

A Managua, Nicaragua, cable to the New York Times says that, at the request of the Nicaraguan Minister of Agriculture, Congress is engaged in enacting a tax of 40 cents each on the male inhabitants of the republic between the ages of 18 and 60, to raise money to combat the locust plague, which threatens to wipe out the cereal and other crops and which is destroying much vegetation. A tax of 1 cordoba per 1,000 cordobas has been declared on capital for the same purpose.

FRUIT INSECT INVESTIGATIONS

Dichlorethyl ether dissolved in water effective against larvae of plum curculio in soil.--Oliver I. Snapp and J. R. Thomson, Jr., of the peach-insect laboratory at Fort Valley, Ga., report that dichlorethyl ether dissolved in water at a rate as low as 10 cc per gallon of water is very effective against larvae of the plum curculio in the soil. Not a single individual reached the adult stage in the cages where 10 cc of dichlorethyl ether in 1 gallon of water per square yard of soil was used against the larvae. When used against the pupae in the soil, however, 10.6 percent of the pupae reached the adult stage when a stronger solution--33 cc per gallon--was used. Seventy-seven percent of the individuals placed on the check soil emerged as adults, which indicates that favorable conditions for rearing were maintained in the medium in which these experiments were conducted.

Influences controlling spring populations of dried fruit beetle.--Census trapping of Carpophilus hemipterus L., using traps baited with fermenting dried peaches, have been carried on by Dwight F. Barnes, of the Fresno, Calif., laboratory, during the last seven springs. Although measurements of populations entering hibernation are lacking, the trap catches show relationships between over-winter survival and weather. Accumulated departures from normal rainfall and temperature, from November through April, and the catches of beetles in March, April, and May have been compared by Mr. Barnes. In addition to the years 1931-37, there are records of heavy infestations in the springs of 1928 and 1930, making a total of 9 years available for study. The 5 years of lightest rainfall from November through April were associated with above-normal survival. The five November-April periods when monthly mean temperatures were highest were associated with survival of more than the average number of beetles. The lightest spring population, that of 1937, followed a cold, wet hibernation period; the heaviest survival, in 1928, was correlated with dry, mild weather during the preceding winter and early spring.

Emergence of Japanese beetle.--T. H. Dobbins reports that the first field find of the Japanese beetle in the vicinity of Moorestown, N. J., was on June 14. Occasional beetles have been reported a few days earlier from protected places, but the June 14 find is considered as representing average field conditions. Thereafter, emergence continued rather more slowly than usual, as a result of the comparatively cool, cloudy weather until toward the end of the month, when the beetles were to be found locally in abundance.

Overwintering of Japanese beetle in New England.--I. M. Hawley, of the Springfield, Mass., sublaboratory, reports having found a few Japanese beetle eggs in plots at Keene and Concord, N. H., during examination of the plots early in June. None of the eggs hatched, however. The surveys showed that eggs deposited late in the preceding season failed to survive the winter, even though it was extremely mild and lacked the usual snow cover. It also appears that larvae entering hibernation as newly hatched first instars also failed to survive the winter.

Asiatic garden beetle parasite recovered.--J. L. King and L. B. Parker, of the Japanese beetle laboratory, Moorestown, report the recovery of Tiphia sternata Parker, an imported parasite of Autoserica castanea Arrow. The first colonies of this species were released in 1933. This is the first recovery made of the species, although the recovery is from a release made in 1936.

Hymenopterous parasite of Japanese beetle becoming established.--At the Japanese beetle laboratory at Moorestown, J. L. King, T. R. Gardner, L. B. Parker, and M. H. Brunson liberated 154 colonies of Tiphia vernalis Roh., an imported parasite of the Japanese beetle, in New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia late in May and early in June. This material was collected from five established colonies near Philadelphia, Pa. Recovery scouting showed that the parasite was established at at least 100 of the liberation sites, indicating an establishment of at least 65 percent.

MEXICAN FRUIT FLY CONTROL

The situation in the lower Rio Grande Valley.--The taking of the citrus census was completed in a few districts and is rapidly drawing to a close in others. Unusually hot and dry weather has retarded the development of fruit in some sections. Growers have had to irrigate their groves in order to keep much of the young fruit from dropping. Rust mites are active throughout the area. The number of adult Anastrepha ludens trapped in Texas decreased from 878 in May to 41 in June. All but four of these flies were taken before June 15. The numbers of adult fruit flies of all species trapped in Texas in June were as follows:

<u>Anastrepha ludens</u> Loew-----	41
Premises-----	29
<u>A. serpentina</u> Wied.-----	9
Premises-----	9
<u>A. acidusa</u> Walk.-----	2
Premises-----	2
<u>A. pallens</u> Coq.-----	490
Premises-----	145
<u>Toxotrypana curvicauda</u> Gerst.----	1
Premises-----	1
Total-----	543

No fruit fly larvae were found.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Chinch bug not especially partial to any one kind of small grain.--C. M. Packard, Lafayette, Ind., reports that infestation in general is light in East Central States as a result of high winter mortality and a cool, wet spring. Two months' observations in south-central Illinois agreed with those of past 3 years. No single kind of small grain is sufficiently more attractive than the others to bugs leaving hibernation to serve effectively as a trap crop. Attractiveness to the old bugs depends fully as much on thinness of stand as on kind of grain. The elimination of all small grains, except perhaps oats, would be necessary to effective reduction of the spring brood in a neighborhood, and even then under some conditions considerable infestation would be likely to develop in some oat fields.

Cotton seed hulls make good bait for armyworm.--C. M. Packard, Lafayette, reporting on the course of the extensive outbreak observed in Mississippi, Arkansas, Oklahoma, and south-central Illinois, says that airplane dusting was successful where thorough coverage with calcium arsenate at 15 to 30 pounds per acre was obtained. Standard poisoned-bran bait was used on a large scale with excellent results where properly applied. In experiments cottonseed hulls and alfalfa meal were fairly good substitutes for wheat bran, but required the addition of molasses, which greatly increased their efficiency. Pure wheat bran was highly efficient without molasses. Sawdust alone did not make an attractive bait but could be used up to half-and-half with more attractive carriers with fair success. Sodium arsenite was superior to white arsenic or paris green as a poison.

Corn earworm more abundant this year in Illinois and Missouri.--R. A. Blanchard, Urbana, Ill., reports that only one adult (found at Charleston, Mo.) was obtained from the four sets of hibernation cages under observation in Illinois and Missouri. Heaving of the soil plus large amounts of rainfall are two probable reasons for this condition. Notwithstanding the lack of emergence from the hibernation cages the earworm has appeared much earlier and in greater abundance than last season. A number of living pupae were found in dry, sheltered areas around the cannery buildings at Hoopes-ton, Ill., one area where considerable early infestation has occurred. Several examinations of green corn shipments by rail from the South were made at St. Louis and Chicago. Large numbers of full-fed larvae were found below the false floors of the cars after they were unloaded. In case cars are left standing in freight yards for sufficient periods they may offer a source of early infestation in areas north of the natural limits of Heliothis obsoleta. Green corn containing large H. obsoleta larvae was observed in the markets at Urbana and Champaign by May 26, 1937.

Alfalfa weevil conditions and control.--J. C. Hamlin, Salt Lake City, Utah, reports that cultural control experiments at Medford, Oreg., demonstrated that clipping immature first growth is valueless and that early cutting is a practical control in favorable weather.

JAPANESE BEETLE CONTROL

Large-scale fumigation of empty refrigerator cars.--From 200 to 400 empty refrigerator cars have been fumigated daily at the Banks, Farnhurst, and Porter, Del., sidings of the Pennsylvania Railroad since June 15, the effective date of the season quarantine on fruits and vegetables. At these sidings 3,652 cars were fumigated from June 15 to June 30. These cars comprise all empty refrigerator cars moving into the Del-Mar-Va peninsula. Practically all of the cars are used for the movement of the Eastern Shore potato crop. Fumigation of all empty cars and loading of the potatoes under the supervision of an inspector make it possible to issue a certificate for each car. This work was organized at the request of the railroad officials. Bureau inspectors check the temperature of the interior of each car and observe that the drain plugs are plugged and all doors and hatches are closed before the car is fumigated. There are 20 temporarily employed inspectors supervising the fumigations. The fumigant is purchased by the railroad, and railroad employees perform the fumigation operations. Railroad employees, as well as our inspectors, are provided with gas masks. Application of the fumigant has been reduced to a comparatively simple operation, involving much less hazard to the operators than when liquid hydrocyanic acid was forced from tanks into small cans set in shallow pans hung from the hatchways. Now paper discs approximately 3 inches in diameter and 1/8 inch thick, impregnated with the required dosage of HCN, are supplied in sealed cans. Twelve of these discoids are strung together on a string about 5 feet long, each disc hanging separately. Two series of discs are packed in one can. Together these contain 6½ ounces of the fumigant, sufficient for fumigating one car. A special type of can opener is used to open the cans and a string of discoids is suspended from one of the bunker doors at each end of the car. Drips from the bunker pans are plugged with waste prior to fumigation, and the hatches are closed immediately after the string of discoids has been suspended. Both doors are sealed with "USDA" seals after fumigation. At the end of the 2-hour fumigation period the hatch plugs are removed and screens are placed over the hatch openings to prevent reinfestation of the car. Such cars are opened only while being reiced en route to destination. The railroad is employing 120 men in connection with the cleaning of refrigerator cars and their fumigation at the sidings near Wilmington. In addition to the Bureau's inspectors at these sidings, there are 35 inspectors scattered among as many loading points on the Eastern Shore to prevent the infestation of cars during loading. In the Philadelphia area empty refrigerator cars were thoroughly inspected from June 15 to 27. Screening was required after June 21 and fumigation of empty cars was started by the railroad companies voluntarily on June 28. Fumigation of loaded cars will start as soon as the adult beetles become numerous enough to warrant this procedure.

Japanese beetle emergence.--Adult beetles were first observed in the Richmond, Va., district on June 3, and 70 beetles were collected at the pump house along the James River on June 4. Reports of beetle emergence in the Philadelphia district were received during the week beginning June 7. Adult beetles appeared in the Harrisburg, Pa., district the week beginning

June 21. The earliest reported collection of an adult in northern New Jersey was on June 22. Early infestation of farm products was evidenced by the finding late in the month of 24 Japanese beetles in 3 shipments of New Jersey beans inspected at Boston for consignment to nonregulated territory in Maine. Emergence at Glen Falls, N. J., was reported on June 29. Twenty-five traps were set in South Boston on June 29 and June 30, to indicate the first emergence of the insect in that section. Three beetles were trapped on July 1. Few beetles have emerged in the Philadelphia district. A heavy emergence is in progress in the metropolitan New York area. A crew member of a steamship docking at Chester, Pa., on June 27 advised the maritime inspector that the crew did not see any Japanese beetles flying over Delaware Bay until they had passed Claymont, Del. Only a few adults were observed in flight. An exceptionally heavy flight of the beetle in Washington, D. C., is also reported.

New Jersey inspection activities.--Very few beans and peas have been presented for inspection in the South Jersey district. Poor weather and failure to control insects and diseases resulted in many crop failures. Usually a dozen or more inspectors are kept busy inspecting and certifying beans and other farm products moving from the Glassboro district. During the latter half of June, certifications in the Glassboro district were limited to two carloads and two truck loads of beans. In the Trenton district, 20 carloads and 1 truck load of beans and 1 truck load of cabbage were inspected, and 20 empty refrigerator cars were fumigated. Fumigation of blueberries at the New Lisbon fumigation house of the Blueberry Growers Association is scheduled to begin about July 4. Applications of additional dosages of lead arsenate to bring the concentration up to 1,500 pounds per acre were made by June 30 in nurseries maintaining certified heeling-in areas.

Seasonal quarantine activities.--Demands for inspection and certification of fruits and vegetables during the seasonal quarantine on these commodities starting June 15 were met by the establishment of 39 inspection centers in all principal market areas within the regulated area. Scouting of heretofore uninfested classified nurseries and greenhouses was started in Virginia, Maryland, and Delaware on June 17. The first scout find on a classified nursery was made in the Richmond district on June 17. Several first-record nursery infestations were reported later in the month from the Baltimore and Salisbury, Md., and the Exmore, Va., districts.

Nurseries scouted for gypsy moth.--Scouting for gypsy moth infestation in nurseries located in the lightly infested area in Connecticut was performed in June. Scouts concentrated particularly on the blue spruce and deciduous plantings and on trees bordering the premises. These nurseries were all found to be free from infestation. Very few larvae of any species were found. These uninfested nurseries will be entitled to gypsy moth certification for all their stock without the customary inspection between digging and shipping. Later, if the nurseries are found to be free from Japanese beetle infestation, they will be entitled to joint certificates under quarantines 45 and 48.

Larval infestation in inspected shipments.--Among shipments presented for gypsy moth inspection and certification during the month were 11 consignments, mostly of lumber, on which were found 76 gypsy moth larvae. Seven of the infested shipments were examined at Deering Junction, Maine. The largest number of caterpillars found on a single shipment totaled 40 larvae taken from a carload of lumber inspected at Ashland, N. H., for shipment to Lennoxville, Quebec.

Current Dutch elm disease activities.--By the end of June the scouting force had been increased to 3,159 men. Eradication-crew members numbered 667, and 753 men were working in sanitation crews. The total W. P. A. force on June 30 was approximately 4,300, and the grand total of all men engaged in Dutch elm disease eradication work was 5,300. During the month 13,033 specimens were collected from elms showing apparent symptoms of Graphium infection. Laboratory reports rendered included 1,340 positive cases of the disease and 5,426 miscellaneous cases. Eradication crews felled and burned 699 infected trees and sanitation crews removed 10,300 dead and devitalized elms. Activities of sanitation crews working in clear-cutting areas accounted for the removal of an additional 37,920 elms. Tree-medication crews treated 2,551 trees in areas to be made elm-free.

Dutch elm disease scout schools.--Scout schools were set up in New Jersey, New York, Connecticut, and Maryland early in June. Approximately 1,300 men were in training the first week in June. Difficulty was experienced in Connecticut and New York in obtaining referrals from the W. P. A. of men suitable for the duties required of a Dutch elm disease scout. All prospective scouts from sanitation crews already employed were transferred to the scout schools. Among the tests to determine physical fitness for this work are: Eye test, ladder climbing, rope throwing, and rope climbing. Other tests for adaptability include tree identification, identification of Dutch elm disease symptoms, map reading, and preparation of reports. Most of the scouts who completed their training satisfactorily were placed in the field during the week ending June 12.

Autogiro scouting.--During the week ending June 5, the autogiro unit engaged in inspecting elms along railroad rights-of-way completed a 1,260-mile strip along the following railroads: Southern Railroad from Chattanooga, Tenn., to Birmingham, Ala.; Louisville & Nashville Railroad from Birmingham, Ala., to Louisville, Ky.; and Illinois Central from Louisville, Ky., to New Orleans, La. Nine elms were sampled by the ground crews on the basis of observations made from the autogiro. The entire southern loop of railroad scouting was finished on June 28. Systematic scouting with another autogiro unit was started in New Jersey on June 10. On June 15 a second autogiro crew started scouting in New Jersey, and on June 17 a third plane started operations.

Decrease in 1937 June confirmations.--A decrease in Dutch elm disease cases discovered during June is indicated by scouting results. From June 1 to July 4, 1936, 14,331 suspects were collected and 1,533 confirmations reported. From May 31 to July 4 of this year, 13,177 suspects were collected and only 1,352 positive infections determined.

Indianapolis confirmations.--Dutch elm disease infection in six elms in Indianapolis was reported in June. The center of infection is in Crown Hill Cemetery.

FOREST INSECT INVESTIGATIONS

Destruction of Douglas fir buds reduces budworm outbreak.--J. C. Evenden, of the forest-insect laboratory, Coeur d'Alene, Idaho, reports that a marked reduction in the spruce budworm outbreak followed as a result of an abnormal botanical condition within the Douglas fir stands of the Cody Canyon, Shoshone National Forest, in the spring of 1936. Owing to an unseasonal climatic condition, from 90 to 95 percent of the new-growth buds on the Douglas fir trees were injured and failed to produce any new growth. Though these buds started to swell, they failed to open. This condition is believed to be the result of a few days of abnormally warm weather, followed by a period of below-zero temperatures. Very little new foliage was produced from these trees in 1936, which undoubtedly was responsible for a marked reduction in the spruce budworm outbreak. The examination of this area during the latter part of June indicated this reduction in the insect population but showed that the trees were recovering and had produced 1937 growth through adventitious buds.

Bark beetle parasite limited by bark thickness.--W. D. Bedard, Coeur d'Alene, in reporting on the abundance of beneficial insects under various environmental conditions, states that Coeloides dendroctoni Cush., a parasite of the mountain pine beetle, is seriously hampered by excessively thick bark. As this small braconid deposits its eggs through the bark on mountain pine beetle larvae, if the bark is thicker than the length of the female's ovipositor, oviposition is impossible. In the following table the average number of Coeloides per square foot is shown for different bark thicknesses.

Bark thickness	: Available for oviposition:	Coeloides
Inches	: Trees : Bark : emerging	
	: Number : Square feet : Number	
0.2-0.3-----	: 70 : 1,794 : 18.9	
0.4-0.5-----	: 155 : 4,656 : 9.4	
0.6-0.7-----	: 62 : 2,588 : 5.3	
0.8-1.0-----	: 18 : 846 : 2.9	

It is apparent that parasitization is decidedly reduced by the thicker bark. Oviposition in thick-barked trees is undoubtedly accomplished through the deep cracks between the bark plates.

The larch case bearer.--J. V. Schaffner, Jr., of the New Haven, Conn., laboratory, reports as follows concerning Coleophora laricella Hbn.: "Permanent sample plots were examined during June and collections for parasite recoveries were made at six of them. The defoliation of each numbered larch tree was estimated and the average for each plot is summarized and given below, with similar data for last year for comparison.

Locality	Average defoliation in--	
	1937	1936
	Percent	Percent
<u>Maine:</u>		
Corinth-----	10	17
Sidney-----	64	32
<u>Massachusetts:</u>		
Lunenburg-----	42	39
North Andover-----	46	36
<u>New Hampshire:</u>		
Berlin-----	70	60
<u>New York:</u>		
Greenfield-----	20	28
Saranac-----	88	91
<u>Vermont:</u>		
Sharon-----	42	33

"In the sprayed plots at Sidney, Maine, and Sharon, Vt.", Mr. Schaffner says, "very good control was obtained and there is a considerable contrast between the sprayed trees and nearby trees not sprayed. The foliage on the sprayed trees is a deeper green and the needles are longer. Moths began issuing on June 5, the maximum issuance being about June 10, and some parasites are still issuing. In and around the plot at Saranac, N. Y., at least 25 percent of the larch trees have died since 1935."

Pine sawfly prevalent in Massachusetts.--Mr. Schaffner also reports: "An extensive survey made in June revealed that the sawfly Neodiprion sp. was prevalent in red pine plantations in Middlesex and Worcester Counties, Mass. It was also found in one natural stand of red pine at Groton, Mass. Large-scale spraying operations were conducted on watersheds and private property to prevent serious defoliation."

Dendroctonus piceaperda Hopk. in Vermont.--Mr. Schaffner reports as follows concerning D. piceaperda on the Green Mountain National Forest: "Most of the hibernating adults had issued and were making new galleries or laying eggs in green trees on June 19. No hatching was observed on that date. A small percentage passed the winter in the larval stage and these were transforming to adults. Fresh pitch tubes and borings were noticeable, especially on trees on the slopes. In the periphery of the heavily infested area the large living and dead spruce were counted in five 1/5-acre plots taken at random. Of a total of 101 trees, 48 were dead."

Parasites of European pine shoot moth received.--P. B. Dowden and P. A. Berry, New Haven, report that during June the following parasite material of Rhyacionia buoliana Schiff. was received from W. F. Sellers,

Wageningen, Holland: Hymenopterous cocoons, 2,700; tachinid puparia, 302; host larvae parasitized by Copidosoma, 6,483.

Control of white pine weevil and European pine shoot moth.--S. F. Potts, New Haven, reports that good control of Pissodes strobi Peck in an artificially infested tree was obtained by spraying with concentrated lead arsenate and lime sulphur, with a sticker and spreader added, whereas the ordinary spray concentrations were ineffective. Complete control of this weevil was effected by using both ordinary and concentrated spray mixtures of cryolite, with linseed oil or fish oil as a sticker and a spreader added to the mixture. Derris resinate also gave complete control but its use would probably be limited because of its high cost. In connection with studies on the control of the European pine shoot moth by the use of insecticides, Mr. Potts observed that practically all of the infested lateral shoots of red pine produced male moths, while over half of the infested terminals yielded females. Mr. Potts suggests as an explanation that there is apparently an insufficient quantity of food in the laterals for the female larvae which are considerably larger than the males. Mr. Potts reports that seven woodland plots were sprayed from an autogiro at Whitesbog, N. J., on June 23. Concentrated spray mixtures used in these tests contained lead arsenate, calcium arsenate, bordeaux mixture, derris, and lime sulphur. Fish oil and paraffin oil were tested as adhesives. Two kinds of spreaders and wetting agents were tried. Leaf collections were made for chemical analysis. These experiments were conducted in cooperation with C. W. Collins and R. R. Whitten, of the Morristown, N. J., laboratory.

Elm bark beetle as vector of Dutch elm disease.--R. T. Webber, of the Morristown, N. J., laboratory, reports concerning an experiment that he conducted with the native elm bark beetle (Hylurgopinus rufipes Eich.) as a vector of the Dutch elm disease fungus. This experiment was suggested because of the fact that the beetles hibernate in tunnels in the bark of living elm trees. If such beetles are contaminated with the fungus and reach the xylem in the course of their activities the trees might thus become diseased. Four elm trees from 3 to 4 inches D.B.H. were brought from Middletown, N. Y., in September 1936 and transplanted in a large cage in the laboratory yard. One thousand H. rufipes adults artificially contaminated with the fungus were confined to the trunk of each tree in cloth sleeves on September 30. All four trees showed external symptoms of the disease after foliage appeared in 1937 and were later confirmed as affected. The bark was subsequently removed from the trunks of the trees and numerous points where the beetles had contacted the xylem were found. Most of these contacts were made in the fall of 1936 but a few were probably made during the warm days of the winter or the early spring of 1937. As the Dutch elm disease fungus has been cultured this year from H. rufipes adults taken from their hibernation tunnels in the field, and as instances have been noted in the field where the xylem was contacted, apparently by the adults, the results of Mr. Webber's experiments are of particular interest. H. rufipes may be a more important vector of the Dutch elm disease fungus than has heretofore been supposed.

Parasitization of fall cankerworm.--The Morristown laboratory has cooperated with the National Park Service in connection with spraying work which the latter has done in the Morristown National Historical Park. The spray material was applied for the control of cankerworms by means of an autogiro. An undetermined egg parasite was found to have reduced the emergence of Alsophila pometaria Harr. in the Park. C. H. Hoffmann collected 1,935 egg masses from which neither larvae nor parasites had issued. These were placed in a container at the laboratory and later examined with the following results: Total number of eggs, 15,383; larvae issued from 3,871 eggs (25.1%); parasites issued from 6,289 eggs (40.8%); and from 5,223 eggs (33.9%) neither larvae nor parasites issued. The fact that neither larvae nor parasites issued from 33.9 percent of the eggs may have been due to the unnatural conditions under which the eggs were kept in the laboratory. C. L. Griswold, of the Morristown laboratory, took random samples of cankerworm larvae from various more or less isolated trees in the vicinity of Morristown to ascertain what species was present. The results are as follows:

Food plant	Larvae issuing	
	<u>A. pometaria</u>	<u>Paleacrita vernata</u>
	<u>Number</u>	<u>Number</u>
Elm-----	192	460
Wild cherry----	83	38
Apple-----	71	37
White ash-----	41	0
Linden-----	194	0
Oak-----	423	3
Hickory-----	67	0

The results indicate that, although A. pometaria occurred on all the food plants mentioned, Paleacrita vernata Peck showed a preference for elm, wild cherry, and apple. The locality was apparently not responsible for the difference, as most of the collections were made in two restricted areas.

Insect outbreaks reported.--The forest tent caterpillar outbreak, which has been in progress in northeastern Minnesota since 1932, was very severe again this season, according to reports from L. W. Orr, of the Milwaukee, Wis., laboratory. In 1936 the larvae starved in a number of rather large areas because they had caused complete defoliation of the affected aspen and birch stands before they reached maturity. These areas had very few larvae present in 1937. The more recently infested sections where the population had not reached such a high point in 1936 were heavily infested this year and were completely defoliated. Bureau employees gave general technical supervision to a large amount of spraying work conducted by the Federal Forest Service on the Chippewa and Superior National Forests. Large power sprayers were used to spray limited areas around camp grounds, resorts, ranger stations, C. C. C. camps and other places where protection was especially needed. Effective control was

obtained by using lead arsenate, with raw linseed oil added as a sticker. Present conditions indicate that the outbreak will continue another year.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

General woodland spraying begun.--Large-scale spraying of woodland areas was commenced on June 1 in Massachusetts, Connecticut, New York, and Pennsylvania. Two sprayers were also operated east of the barrier zone in Vermont, treating high elevations that threatened the zone area.

Spraying not completed on total acreage planned.--It was not possible to spray as great an acreage as had been planned, because of the unusual amount of rain that fell during the gypsy moth spraying season. Spray mixture does not adhere well to the wet foliage of underbrush unless there is a good circulation of air. Spraying under such conditions can be efficiently done only in areas where most of the underbrush has been removed or where underbrush failed to develop, and some material must be used to stick the spray material to the foliage. Without the use of fish oil as an adhesive, much of the poison would have been washed to the ground before any benefit had been derived. Workers patrolling burlap bands in areas where the infestation was relatively heavy prior to spraying report very few living caterpillars under the bands a day or two after such treatment.

Spraying suffers from lack of experienced men.--In some localities where men experienced in gypsy moth spraying were not available it has been necessary to train inexperienced men in the methods of dragging hose through the woods, in holding the nozzle, and in operating the sprayers. There is a marked difference between the quality of work performed by inexperienced labor and that done by men who have had at least one season's experience in spraying wooded areas. The position of nozzleman is especially important and the results obtained depend, to a considerable extent, on his ability to do his work well. It is often necessary to try out several workers in order to find a reasonably satisfactory nozzleman.

Field work hindered by maturing hay and grain crops.--Hay and grain crops in the gypsy moth infested region are fast reaching maturity, and the workers assigned to duty patrolling burlap bands and scouting trees in open country are finding it difficult to reach the trees without damaging the crops. Most of the hay and grain will be cut during the next few weeks.

Former members of thinning crews most adaptable for spraying work.--Spraying work is done largely by W. P. A. workers who have been transferred from other gypsy moth control activities for the short period when spraying is practicable.

All sprayers in the field visited periodically by skilled mechanics.--Several mechanics from both the Greenfield, Mass., and Wilkes-Barre, Pa., storehouses were detailed to the field to visit all sprayers in operation,

make any adjustments or minor repairs necessary, and instruct the men in the proper handling of the machines. In this way loss of time due to mechanical difficulties is kept at a minimum.

Foliage sprayed in 1936 still retains arsenate of lead.--The employee supervising spraying work in the vicinity of Blandford, Hampden County, Mass., where a large percentage of the undergrowth is laurel, reports that, in recently walking through an area sprayed in June 1936, he saw evidence of arsenate of lead remaining on the foliage from last year's treatment.

Scouting completed on islands in Lake Champlain.--Scouting of the numerous small islands in the Vermont section of Lake Champlain was completed on June 30 and no gypsy moth infestations were found. The islands range from an area of only a few acres with a limited number of trees to islands of approximately 300 acres with dense tree growth. The tree growth on many of the smaller islands was nearly 100 percent white cedar, which is unfavorable for the development of the gypsy moth. Much of the growth on the larger islands was hardwood, the predominating species being elm, poplar, and oak, and many of the individual trees were enormous. A small motorboat with a licensed pilot was hired to transport the workers. The unsheltered islands were scouted on good days, and on days when the waters were rough and dangerous work was performed, if possible, on islands in bays and in other protected locations. Gypsy moth employees have observed many nests of sea gulls and wild ducks, particularly on the smaller islands not used for recreational purposes.

Water plentiful for spraying but biting insects annoy workers.--An adequate supply of water for spraying work has been available in most of the territory in New England where such work was being performed, owing to the heavy rains that fell in this area during May and to frequent thunderstorms. However, the surplus water gathered in swampy areas, resulting in an abundance of mosquitoes, which attacked the workers employed in woodland spraying and scouting for the gypsy moth, especially in the lowlands. The annoyance became so pronounced in an area near Lake Dunmore in Salisbury, Vt., that work had to be temporarily discontinued.

Emergency spraying in Berkshire County, Mass.--During the latter part of June several gypsy moth caterpillars were found under burlap bands in Sheffield, Berkshire County, Mass., where a single egg cluster was located during the scouting season in rough ledgy country. Arrangements were made to transfer a machine from Connecticut during the last 2 or 3 days of the month in an effort to completely eradicate this infestation. An area of 24 acres in the region where the caterpillars were found was thoroughly sprayed.

Shortage of workers impedes gypsy moth spraying in Connecticut.--It has been impossible to obtain the full quota of relief workers requisitioned for spraying work in some parts of Connecticut, in Litchfield County in particular. It has been necessary to shift workers daily from one spraying crew to another in order to equalize the number of men in the crews and to keep the sprayers in operation. Two sprayers were transferred from Connecticut to Massachusetts and two to Pennsylvania, where relief labor was available and where spraying was urgently needed.

Spraying in New York.--While some time was lost due to rain, good progress was made in the spraying work being carried on in Ulster and Putnam Counties, N. Y., and workers patrolling burlap and tanglefoot bands reported a marked decrease in gypsy moth larvae in areas where spraying had been done. Spraying was completed at a small infestation recently located in the town of Amenia, Dutchess County, and at another in Chatham, Columbia County.

Long hose lines used in Pennsylvania.--The topography of the gypsy moth infested territory in Pennsylvania is very mountainous and much of it is heavily wooded. It is sometimes necessary to repair abandoned roads, old wood roads, and trails in order to locate the sprayers at an adequate water supply. The infestations are often at a considerable distance from the nearest water and in places not easily reached. At one location the spray hose was suspended from a wire cable attached to trees on either side of the Lehigh River for a distance of approximately 150 feet, so that a serious infestation could be sprayed. One hose line 12,000 feet in length was operated in Kidder Township, Carbon County. This is the longest hose line so far used in the work. Numerous other hose lines in this region range from 1 mile to more than 8,000 feet in length.

Spraying in Lackawanna and Susquehanna Valleys expedited by water company.--The Spring Brook Water Company has cooperated with this activity to the fullest extent by supplying water from their hydrants for spraying residential areas in the Lackawanna and Susquehanna Valleys in Pennsylvania, and has permitted water to be taken from the streams and reservoirs owned or controlled by the company in order that several serious infestations in woodlands might be sprayed.

Corn borer project loans 16 sprayers for gypsy moth work.--Two spraying machines belonging to the corn borer project and loaned for gypsy moth work arrived in Wilkes-Barre, Pa., on June 11. They were driven over the road from Cleveland, Ohio, and made a total of 16 sprayers loaned to this activity by the corn borer project this year.

Notices of treatment issued in Pennsylvania.--Up to the middle of June 85 State department of agriculture notices of treatment for control of the gypsy moth had been issued by the State representative to property owners who had refused to sign Federal permits for spraying needed on their properties. These properties will be sprayed under the direction of the State representative at the expiration of the 5-day interval provided in the notice, if treatment work has not been done by the property owners concerned. More than 4,000 Federal permits to spray were obtained in this area.

All gypsy moth work temporarily suspended.--All spraying work was discontinued and the spraying machines and hose were washed and returned to the various storehouses by the end of June. The services of all workers were terminated when the maximum hours for the month had been worked, as no definite information had been received concerning W. P. A. or regular appropriation funds for use during the fiscal year 1938. As soon as the Gypsy Moth

Office was advised that funds were available for work during July, approximately 1,900 workers employed on this activity during June were notified to report for duty on the morning of July 6.

Nearly 6,000,000 new egg clusters creosoted in New England by C. C. C.--The creosoting of gypsy moth egg clusters was discontinued early in June. Since the first of July last year, C. C. C. enrollees have treated over 5,900,000 new egg clusters. Of these, approximately, 5,486,000 were creosoted in Massachusetts, 80,000 in Connecticut, 124,000 in Vermont, and 209,000 in New Hampshire. Federal gypsy moth work in New Hampshire has been discontinued.

Close Federal supervision of C. C. C. gypsy moth work maintained.--A representative of the Federal Gypsy Moth Office visited C. C. C. gypsy moth work at 24 colonies in Vermont, 18 in Massachusetts, and 14 in Connecticut during the first week in June. Burlap had been applied to the trees at most of these colonies. No previous work had been done at some of the places visited and extremely heavy infestations were present, but the caterpillars were much less abundant at other locations where thinning, cleaning, and creosoting work had been done during the winter.

The brown-tail moth project.--The brown-tail moth project was terminated at the end of June and all the crews were dismissed at the end of the working period. The crews in Maine, New Hampshire, Vermont, and Massachusetts had been engaged during the month in the elimination of old apple, wild cherry, and other favored food plants.

PLANT DISEASE CONTROL

Barberry bushes destroyed on 31 properties in South Dakota.--Although the number of barberry bushes removed in South Dakota is small in comparison with States farther east, survey work since W. P. A. funds became available in 1935 has resulted in the eradication of nearly 1,000 bushes on 31 different properties. According to G. W. Eade, in charge of the work in this State, survey has been confined largely to areas where bushes had been located in previous years. Much of the river territory and timbered areas bordering lakes has been surveyed, and 2,734 square miles of territory in 15 counties have been covered.

Stem rust damage to winter wheat.--With most winter wheat harvested, a summary of rust observations made during the past 6 weeks shows that considerably more than the normal amount of stem rust developed in the winter wheat area this year. Stem rust occurred in damaging quantities in eastern Kansas, eastern Nebraska, throughout northern Missouri, central Indiana, and central and northern Illinois. The extent of loss has varied widely, depending on local weather conditions, particularly on the amount of moisture present during the critical stage in the development of the crop. The greatest damage to winter wheat probably occurred in the western half of Missouri, western Illinois, central Indiana, and western Iowa. Serious damage was reported in some fields in southern and eastern Nebraska; however, early crops matured

without appreciable damage and the heaviest losses were noted in the more susceptible soft-wheat varieties. In many localities good yields are reported, even though rust was abundant at harvest, indicating that the crop was practically made before the rust became prevalent.

Stem rust in the spring-wheat area.--On July 11, according to telegraphic reports from E. C. Stakman, St. Paul, Minn., heavy rust was present on spring wheat as far north as Fargo, N. Dak., particularly on Marquis, Reward, and Ceres. The amount of rust damage will vary widely, depending on the stage of maturity of the crop on July 10 and on moisture and temperature conditions.

Rust spreads from barberries to oats in Pennsylvania.--L. K. Wright, in charge of barberry eradication in Pennsylvania, reports that stem rust on oats in that State appears to be confined largely to direct spreads from barberry bushes. On July 10 he reported that there was considerable variation in the severity and prevalence of stem rust on oats, depending on the distance from barberry bushes. In Centre, Huntingdon, Wayne, Wyoming, Lackawanna, and Susquehanna Counties stem rust has not spread farther than the fields immediately adjacent to bushes. In Crawford and Erie Counties rust may be found for a distance of about 3 miles from the known limits of the barberry areas. According to Mr. Wright, there will be heavy damage in many fields of both wheat and oats where infected barberry bushes are nearby.

Blister rust control in the sugar pine region.--Five additional blister rust camps were established in California during June--three on the Eldorado National Forest and two on the Stanislaus National Forest--making a total of eight camps now in operation in the State. Eradication work was carried on in three National Forests--the Sierra, Stanislaus, and Eldorado--with a total of 1,057,827 Ribes being removed during the month from 6,110 acres, with 7,755 man-days of labor. Fairly good work is being done by the W. P. A. labor. A number of experienced men have returned and are of considerable assistance in breaking in new men and keeping crew rework to a minimum. Many of the men who report for work lack proper clothing and shoes for woods work. Fine cooperation was displayed by both W. P. A. and S. R. A. officials relative to the assignment of laborers, which greatly facilitated the movement of men to blister rust camps. In Oregon eradication work was carried on in the Rogue River operation, a total of 171,499 Ribes being eradicated from 3,224 acres with an expenditure of 1,045 man-days of labor. The quota of 115 employees for this operation was not reached until June 15. Rain made field work practically impossible on 16 days of the month. The latter part of the month was devoted to rework of 1934 and 1935 eradication areas.

Phenological data.--The first blister rust aecia observed this season in Michigan were seen on May 1 in Nawaygo County; in Wisconsin on May 9 in Shawano County; and in Minnesota on May 20 in Isanti County. The first uredinia were observed on May 24 in Isanti County, Minn., on Ribes hirtellum. Fruiting and immature cankers were reported in Maryland on May 4, 7, and 13 and by the 19th of May aecia had been found at several locations in Garrett

and Allegany Counties. The State leader from Virginia reports that blister rust in the aecial stage was found in May on three pines on the ridge of the Shenandoah and Tearjacket Mountains, at the Augusta-Highland County line. One had 8 infections, one 7, and one 3. Four of the infections were in the active aecial stage. The first aecia reported for the season in Virginia were seen on March 25.

Ribes eradication in the Northeast.--During the month of May, Ribes-eradication work was performed in the Northeastern States under four programs--E. C. W., W. P. A., A. R. A., and regular. As a result of 28,296 man-days of work by 2,470 laborers, a total of 94,989 acres were cleared of 2,380,948 currant and gooseberry bushes. The activities under the E. C. W. program gave employment to 1,703 enlisted men and 115 technical foremen and checkers from 80 C. C. C. camps, whereas on the W. P. A. program an average of 671 men worked 7,771 man-days.

COTTON INSECT INVESTIGATIONS

Toxicity tests against adults of Naupactus leucoloma Boh.--H. C. Young and G. D. Green, Florala, Ala., report the results of toxicity tests conducted during the first half of July. In cage tests on cotton plants, 86 hours after the insecticides had been applied, the beetle mortality was as follows: Calcium arsenate dust, 86 percent; commercial mixture of 75 percent calcium arsenate and 25 percent paris green, 84.8 percent; arsenate of lead dust, 53.3 percent; paris green spray (1 lb. to 50 gal. water), 36.4 percent; mixture of 1 part paris green and 10 parts lime, 20.9 percent; untreated check, 2.17 percent. In laboratory tests, 75 hours after the application of insecticides, the beetle mortality was as follows: Calcium arsenate dust, 100 percent; paris green spray (1 lb. paris green, 4 lbs. lime, and 50 gal. water), 100 percent; commercial mixture of 25 percent paris green and 75 percent calcium arsenate, 96 percent; calcium arsenate spray (4 lbs. to 50 gal. water), 84.6 percent; arsenate of lead dust, 76 percent; mixture of 1 part paris green and 10 parts lime, 69.1 percent; arsenate of lead spray (4 lbs. to 50 gal. water), 64 percent; mixture of 1 part cube (5.66 % rotenone) and 5 parts sulphur, 4 percent; untreated checks, 4 percent. Mr. Young also reports concerning field-cage toxicity tests conducted by Mitchell Wilkins, county agricultural agent of Walton County, Fla. Ninety-five hours after the insecticides had been applied, the beetle mortality was as follows: Calcium arsenate dust, 80 percent; sirup mixture ($\frac{1}{2}$ gal. water, 1 gal. sirup, and 1 lb. calcium arsenate) mopped on plants, 63 percent; mixture of 1 part calcium arsenate and 10 parts lime, 44.4 percent; mixture of 1 part paris green and 10 parts lime, 17.9 percent; untreated check, 4 percent.

Abundance of Naupactus leucoloma Boh.--Messrs. Young and Green also report that on July 14 one man in 4 hours collected 4 gallons of the beetles from $\frac{1}{2}$ acre of cotton. It was estimated that there were 20,000 beetles per gallon, or that 80,000 beetles were collected, or at the rate of 160,000 per acre. As the bag-and-hoop method was used for collecting the weevils shaken from the plants and only about two-thirds of the beetles were captured, they were present at the rate of about 240,000 per acre. There were about 2,500

plants on the $\frac{1}{2}$ acre, thus the average catch per plant was 32 beetles. This collection was made 1 mile west of Lockhart, Ala. This cotton field probably had more beetles than any other field, but the collection was not made in the most heavily infested portion. Actual counts have shown as many as 250 beetles on one plant.

Pink bollworm parasites.--L. W. Noble and W. T. Hunt, Presidio, Tex., reporting on parasites of the pink bollworm, state that practically all of the overwinterin, Chelonus blackburni Cameron emerged during April and May. The emergence of this species was considerably later than that of the other species of parasites and was much better synchronized with the pink bollworm emergence, as eggs of the pink bollworm were available at that time on cotton for oviposition. During May and June, 92,000 Chelonus adults were liberated in the early cotton fields of the Presidio Valley, 20,000 were shipped to Puerto Rico, and 3,000 were shipped to Egypt. A shipment of 10,000 larvae of Exeristes roborator Fab., which had been brought through the winter in cold storage, was also sent to Puerto Rico for release.

Emergence of pink bollworm moths.--The emergence of pink bollworm moths from overwintering larvae, in several series of experiments to determine the factors influencing the survival, are reported on by A. J. Chapman and associates, of the Presidio laboratory. In comparable hibernation cages the moth emergence this year from overwintering larvae in bolls was 10.98 percent, as compared to 6.29 percent in 1936. The survival was only 0.47 percent in larvae that spun cocoons in the soil. It is believed, however, that the difference in survival would not be as great under natural conditions as indicated and that the technique used in obtaining a large number of larvae to spin cocoons in the soil of a small area under cages was responsible for a considerable part of the difference. In tests comparing the effect of depth of burial on the survival, the emergence from the two types of material was as follows: Larvae in bolls at 2-inch depth, 23.23 percent; at 4-inch depth, 7.28 percent; at 6-inch depth, 2.66 percent; larvae in cocoons at 2-inch depth, 0.91 percent; at 4-inch depth, 0.45 percent; and at 6-inch depth, 0.03 percent. When computed on the basis of total moth emergence, of the 5,490 moths that emerged from the bolls buried at the three depths, 70 percent came from bolls buried 2 inches; 22 percent from the 4-inch depth; and 8 percent from the 6-inch depth. After the material was buried in the cages it was not disturbed, as material would have been in fields that were planted and cultivated. The experiment shows, nevertheless, that deep burial is an important factor in reducing survival. To determine the effect of cultivating following a spring irrigation, larvae in bolls were buried 6 inches deep. As soon as the soil dried sufficiently to be worked, following the irrigation on March 15, it was stirred to a depth of approximately 3 inches until the soil cracks were filled and a mulch was created. A total of 92 moths emerged from the cultivated cages and 24 from those not disturbed. The results suggest that the cultivation enabled the larvae to work their way nearer to the surface for pupation, thereby increasing the survival. In comparing the effectiveness of one and two winter irrigations and a spring irrigation following winter burial, it was found that when the larvae were buried in December two winter irrigations were much more

effective than one in reducing survival, but there was no significant difference in the number surviving from the one and two irrigations of bolls buried in January. Approximately 7 inches of water was applied in all irrigations. The tests on the influence of the time of winter burial and winter irrigation on survival showed that more moths emerged from bolls buried and irrigated in February (447 moths) than when buried and irrigated in December (312) or January (315). However, when the bolls were buried in December but not irrigated until March 15 the reverse was true, as 1,046 moths emerged from the bolls buried in December, as compared to 392 moths from those buried on March 1. These experiments corroborate previous tests that if fields are to be plowed and irrigated for winter crops, this should be done early in the winter, to be most effective for pink bollworm control; but if the fields are plowed and left without irrigation until spring, postponing the plowing until late in the season (March 1) is more effective. In tests on the effect of the date of a spring irrigation on time of emergence, 52 percent of the moths had emerged by May 5 from cages that were irrigated on March 10, 32 percent from cages irrigated on April 1, and 2.23 percent from cages irrigated on April 20. Thus the delay in spring irrigation tended to delay moth emergence. The early irrigations also tended to scatter the emergence over a longer period, and delaying the irrigation tended to bunch the emergence. In all of the tests with larvae in bolls buried 6 inches deep the lowest survival (1.2 %) occurred in larvae buried on December 1 and followed by two winter and a spring irrigation (December 15, January 15, and March 15), and the highest survival (13.1 %) from larvae buried on December 1 and not irrigated until March 15.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Wild-cotton eradication.--The eradication of wild cotton in southern Florida went forward as usual during June, but with a considerable reduction in the number of laborers employed. Weather conditions were favorable and particular attention was given to locations where there was a possibility of cotton fruiting before the next clean-up. A large number of small seedling plants, which had just come up as a result of early rains, were removed in the Key West area. In the upper west-coast counties practically all of the locations were worked a second or third time. These areas are nearest to cultivated cotton, and for the last several years no wild cotton has been allowed to reach the fruiting stage. All eradication work was discontinued at the end of June. During the month a first clean-up was made on about 4 acres in Collier County, from which 692 mature and 2,057 seedling plants were removed. In the area recleaned 56 mature, 35,970 seedling, and 73 sprout plants were removed. During previous clean-ups a good many wild cotton bolls had been inspected, to get an idea of the condition of infestation. During the last season's clean-up it was decided to preserve samples of green bolls from various locations and inspect them during July and August. This work is now getting under way at Miami. Approximately 700 bolls were inspected as plants were being destroyed and 32 specimens of the pink bollworm were found. These all occurred on several keys off the coast of Monroe County.

Thurberia-plant eradication.--The eradication of *Thurberia* plants in the Santa Catalina Mountains of southern Arizona went forward throughout the month from the camp in Romero Canyon. A total of 1,260 acres was covered and 3,427 *Thurberia* plants were destroyed. Early in the month it was evident that all of the area readily accessible from this camp would be completed by the end of the month, and a new camp site had already been located. There was a plentiful supply of water but this had disappeared when it came time to move the camp. As soon as the summer rains begin there will be plenty of water at the new site and the camp will be established as soon as possible. In the meantime the crews are reworking the Tortillita Range to remove any seedling plants that have come up since this range was first worked.

Laboratory inspection.--The inspection of green-boll samples collected outside of regulated areas was continued at the San Antonio laboratory during June. The results were all negative. At a number of field stations green bolls or bollies are being inspected, these samples having been collected within the regulated areas. The samples are, of course, all inspected in the area in which they were collected. A few specimens of the pink bollworm were found but these did not involve any counties in which specimens had not previously been found during the 1936 crop season.

Lower Rio Grande Valley of Texas.--The first bale of the cotton crop is always produced in the lower Rio Grande Valley of Texas. This year it was ginned on June 14.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Survival of the pea weevil in the Northwest.--Data submitted by T. A. Brindley and F. G. Hinman, of the Moscow, Idaho, laboratory, show that a relatively small percentage of *Bruchus pisorum* L. were able to survive a minimum temperature of -16° F. in the Palouse area of Idaho and Washington, during the winter of 1936-37, when enclosed within hibernation cages in situations unprotected from the elements, but that they failed to survive a minimum temperature of -30° in such situations. In one series of experiments the pea weevils were exposed in small, wooden hibernation cages at nine locations in the Dayton, Wash., pea-growing area during October 1936. At each location two hibernation cages were nailed to the base of the post, two cages were nailed to the top of the post, and two cages were placed in a wooden shelter open at the bottom and nailed to the top of the post. The minimum temperature recorded at Dayton during the winter of 1936-37 was -16° . Upon examining the weevils in this series in May 1937, it was found that the individuals in the cages at the bases of the posts, where they were protected from snow during the greater part of the winter, suffered the least mortality, such mortality ranging from 31.1 to 97.7 percent, with an average of 67.3 percent. Most of the weevils were dead in the cages nailed to the tops of the posts, where they were exposed fully to the elements, the average mortality being 97.7 percent. In the cages placed in wooden shelters at the tops of the posts, where the weevils were protected partially from the weather, the average winter mortality was 83.8 percent. At Moscow, Idaho, where the hibernation cages containing weevils were placed in a kiosk, exposed to changes in temperature but excluding rain

and snow, a small percentage of the weevils survived a minimum temperature of -16° , but none of them were found to be alive following the night when the temperature dropped to -30° . The results from a series of hibernation cages containing weevils placed at progressively higher elevations on Moscow Mountain (2,750, 3,150, 3,650, 4,050, and 4,750 feet, respectively, above sea level), showed that some of the weevils survived at all elevations when the cages were covered with snow, except in the cages placed at the 2,750-foot elevation. The minimum air temperature at this elevation was -21° , while the corresponding minimum temperature at the 3,650- and 4,050-foot levels, was -8.0° and -10.5° , respectively.

Naphthalene not effective as a soil fumigant for wireworms in South Carolina.--Judging from the results of a preliminary experiment performed at Charleston, S. C., by K. L. Cockerham of the Biloxi, Miss., laboratory, it appears that under the conditions encountered in this experiment, naphthalene is not effective as a soil fumigant against the species of wireworms which in recent years have caused severe damage to Irish potatoes in certain districts of the South Atlantic coastal plain. The principal species involved were the gulf wireworm (Heteroderes laurenti Guer.) and the sand wireworm (Horistonotus uhlerii Horn). Crude naphthalene was mixed with the soil of the experimental plots in October 1936, during the operation of plowing, at the rate of 800 pounds to the acre, using the same dosage and methods that have given satisfactory control of wireworms, principally of the genus Limonius, in the irrigated lands of the Pacific Northwest. The experimental plots were located in a wireworm-infested field, classified as Norfolk sandy loam, that had been planted to potatoes in 1936 and which was intended for potato planting in 1937. The potatoes were harvested from this land early in June and velvetbeans were broadcast about July 10. In addition to the velvetbean crop, the land supported a rank growth of weeds, so that a large quantity of green vegetation was plowed under during the process of mixing the naphthalene with the soil. The inclusion of such a large quantity of green vegetation in the soil with naphthalene has been shown, in experiments in the Pacific Northwest, to be unfavorable to the best efficiency of the fumigant. Sampling of the soil in the experimental plots approximately 2 weeks after the application of the naphthalene disclosed that there was no significant difference between the living wireworm population in the treated and untreated plots. The mean soil temperatures during this 2-week period averaged approximately 70° F. at a depth of 4 inches below the soil surface, such temperatures being satisfactory under ordinary conditions to induce favorable results from the fumigant. The potatoes from all plots were harvested on June 1, 1937, and it was found that there was no significant difference between the number and weight of tubers showing wireworm injury in the treated and untreated plots.

Duration of exposure important in evaluating efficiency of hydrocyanic-acid gas against cigarette beetle.--According to data obtained by W. D. Reed and E. M. Livingstone, of the Richmond, Va., laboratory, it appears that a wide margin of error may occur in evaluating the efficiency of fumigants, particularly hydrocyanic-acid gas, when used at relatively low temperatures in

partial vacuum against such insects as Lasioderma serricorne Fab., infesting tobacco bales, when such evaluation is based on the percentage of mortality suffered by test insects removed from the fumigated article at the end of the exposure period. Recent experiments with well-grown larvae of the cigarette beetle in which 3.9 ounces of liquid hydrocyanic-acid gas were used per 1,000 pounds of tobacco gave a percentage of mortality ranging from 51.2 to 83.2 percent at the expiration of the exposure period of 4 hours in partial vacuum. In lots of cigarette beetle larvae left in the tobacco bales for 24 hours the percentage of mortality ranged from 67.2 to 82.4; for 48 hours, from 91.2 to 96.8; and at the expiration of 67 hours, it ranged from 90.4 to 100 percent. The temperature of the tobacco bales during the period averaged approximately 62° F. In order to further determine the residual properties of hydrocyanic-acid gas left in tobacco bales after fumigation in partial vacuum for 4 hours at a dosage of 3.9 ounces per 1,000 pounds of tobacco, test spikes containing cigarette beetle larvae were placed in bales of tobacco that had been removed from the fumigation tank after the customary aspiration or "air washing" of the tobacco bales had been applied. The examination of the test insects after 24 hours showed that the mortality ranged from 39.2 to 60 percent; at the end of 48 hours it ranged from 39.6 to 67.2 percent; and at the end of 67 hours, from 56.0 to 87.2 percent.

INSECTS AFFECTING MAN AND ANIMALS

Larvicide tests for control of subsurface-breeding mosquitoes.--W. V. King reports the following results of a few tests with paris green, calcium arsenite, and phenothiazine, on the killing of Culex larvae in storm-sewer catch-basins. The results are shown in the following table and it may be noted that a high percentage of mortality occurred in nearly all tests. The poorest results obtained were with the two arsenicals when applied as a dust. Paris green mixed with water was also tried on Culex larvae that were breeding prolifically in a grassy polluted ditch. The material was applied at the rate of about 2 pounds per acre, and practically 100 percent mortality occurred.

Material	Rate of application	Average larvae per dip	Kill
		Number	Percent
Phenothiazine:			
(one part in--)	(Dilution)		
Penetrol - 20 parts-----	1-450,000	100	99
Acetone - 5 parts)-----	1-480,000	25	100
	(Pounds per acre)		
Paris green (dry)-----	26	50	89
Calcium arsenite (dry)-----	26	50	70
	(Dilution)		
Paris green (wet)-----	1-200,000	100	99
Do.-----	1-200,000	20	100
Do.-----	1-430,000	50	99 plus
Calcium arsenite (wet)-----	1-100,000	75	93
Do.-----	1-140,000	10	100
Do.-----	1-270,000	40	96

Pyrethrum for repelling sand flies from dwellings.--J. B. Hull, of the Savannah, Ga., laboratory, reports that practical tests of the repelling power of burning pyrethrum were made on porches and in dwellings. By keeping a heavy smudge of the smoke in the vicinity of the parties to be protected from sand flies, few bites were received, even when sand flies were numerous. As soon as the burning powder was extinguished, bites were received, although some smoke remained in the room and the odor was still very strong. Tests were made with a pyrethrum and oil mixture on 18-mesh window screen to see if it would prevent sand flies from passing through the screen. These tests were made in the laboratory and in the field. In the laboratory the screen was coated with the mixture, exposed for different periods of time, and then tested for its ability to prevent sand flies from passing through it. It was found that less than 1 percent of the sand flies would pass through a screen 24 hours after it had been treated with pyrethrum and oil. Screen of the same mesh coated with the oil alone was not so efficient.

Sodium cyanide in control of fire ants.--B. V. Travis reports the following results of preliminary experiments on the use of sodium cyanide in control of fire ants on Forshala Plantation, Fla.: (1) Dry egg cyanide, applied from 3-6 inches deep, is equally if not more effective than when applied as a liquid. The dry application is much cheaper to apply than the wet (solution). (2) Dry egg cyanide, applied 12-24 inches deep, does not prove so effective as the more shallow applications. (3) Better results with cyanide may be expected if the colonies are treated as early as March or April. At this time the colonies are more compact. (4) If a cyanide solution is used, better results are obtained by pouring the solution down the galleries instead of in holes punched in the colony.

Sulphur promising as a dip for sheep tick.--O. G. Babcock, Sonora, Tex., reports that 325-mesh sulphur or the 5,000-mesh sulphur at the rate of 10 pounds to 100 gallons of water will kill all adults of the sheep fly (sheep tick) but not the pupae. The number of dippings and the interval between dippings cannot be definitely stated until the total pupal period has been definitely established. All evidence points to the fact that some of the pupae of the sheep tick (Melophagus ovinus L.) requires a period of from 42 to 50 days for the emergence of the adult tick.

Development of eggs of Aedes vexans Meig. and A. aldrichi Dyar and Knab in nature.--H. H. Stage, Portland, Oreg., reports that weekly out-of-door floodings of soil samples have shown that following a gradual seasonal rise in temperature, eggs of the above species first began to hatch on March 12. However, data accumulated by drying and reflooding such samples in the laboratory showed that by April 15 not more than 6 percent of such eggs were hatching. As time went on, it appeared that the percentage of hatch closely followed temperature variations until the maximum was reached on April 23, when 72 percent of the A. vexans and 67 percent of the A. aldrichi eggs hatched in the first flooding.

Irradiation of mosquito larvae.--Several tests were completed, Mr. Stage says, in which over 800 larvae of A. vexans and A. aldrichi were irradiated with varying amounts of ultra violet light. Data from these tests indicated that daily exposures of 10 minutes at a distance of 18 inches from the carbon arc was detrimental; that 5 minutes a day might be somewhat beneficial; and that 2 minutes was definitely, although only slightly, beneficial to the growth and health of the larvae. In the series of larvae which were irradiated for 2 minutes a day, 66 percent emerged as adults, while in the nonirradiated checks only 56 percent of the larvae reached the adult stage.

Mosquito eggs from nonfertilized females.--Mr. Stage also reports that 32 A. vexans females, which emerged from the pupal stage in separate containers, survived to take one or more blood meals and that 20 of them laid eggs. Of these, 16 laid 1 batch of eggs each; 2 laid 2 batches each; and 2 laid 4 batches each. The average number of eggs per batch was 27.5. The greatest age attained by any of these females was 78 days. The greatest number of blood meals taken by 1 female was 15. This female lived 70 days. A number of eggs laid by these females were dissected 1 and 2 months after having been laid, but none showed embryo development. Eggs also flooded with leaf infusion water gave no hatching. Four virgin A. aldrichi females took blood meals but none laid eggs. Partially developed eggs were found in two of these females when dissected after death. Thus, it is possible that this species is capable of laying eggs without being fertilized. Data indicating that virgin females lay eggs in nature was obtained in 1936, when A. vexans females captured in nature after a blood meal on a horse laid eggs in the laboratory. These eggs apparently were not fertilized, since the customary development of the embryo within the egg did not take place. At this time a large number of eggs were obtained from females caged after having taken blood meals, in which there was no embryo development. A 4-percent sample of 19,000 eggs so obtained showed that 37 percent contained no embryos.

Viability of *A. vexans* and *A. aldrichi* eggs.--A large quantity of soil containing such eggs was obtained in May 1935, according to Mr. Stage, and moved about 1 mile to a screened cage placed under natural out-of-door conditions above the normal flood contour. The eggs contained in this soil were laid during the summer of 1934 or earlier. Twelve samples of this soil are flooded each year on June 1 and September 1. The following average hatches per sample have been recorded:

Year	Larvae hatching in--	
	June	September
	Number	Number
1935----	370.0	174.2
1936----	232.8	34.0
1937----	62.5	--

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Eleven living larvae of the Mexican fruit fly (*Anastrepha ludens* Loew) were intercepted at Laredo, Tex., on April 1 in a sour orange in baggage from Mexico. An adult of the colydiid *Pseudobothridores quadratifer* Heller was taken at Newport News, Va., on May 2 on a dao (*Artocarpus lakoocha*) log in cargo from the Philippines. The thrips *Frankliniella cephalica* (Crawf.) was intercepted at Miami, Fla., on April 21, on rose blossoms in baggage arriving by airplane from Colombia. An adult of the bruchid *Bruchidius histrio* Boh. was found at Washington, D. C., on January 15 with seed of *Lupinus* sp. in baggage from Turkey. H. S. Barber reports that this is new to the National Museum collection. A living specimen of the scale insect *Aspidiotus subcuticularis* Green was intercepted at San Francisco on March 25 on a pomelo in ship's stores from China. A living larva of the turnip gall weevil (*Ceutorhynchus pleurostigma* Marsh.) was taken at Philadelphia on May 4 in a rutabaga (*Brassica campestris*) root in ship's stores from Scotland. A living larva of the Asiatic rice borer (*Chilo simplex* Butler) was found at Baltimore on February 25 in rice straw in cargo from Japan. Living and dead adults of *Bruchidius villosus* F. arrived at Boston on April 16 in tree seed (*Laburnum alpinum*) in cargo from Austria. A living adult of the mango weevil (*Sternuchetus mangiferae* F.) was intercepted at San Pedro, Calif., on April 17 in a mango seed in passenger's baggage from Australia. Living specimens of *Isochaetothrips reticulatus* Crawf. were taken at the airport at Brownsville, Tex., on January 4 on camellias in cargo from Mexico.

Pink bollworm from Cuba.--A living larva of *Pectinophora gossypiella* Saund. was intercepted at New York on March 26 in a cottonseed in baggage from Cuba. The lot consisted of one cotton boll and 16 cottonseed. C. Heinrich reports the specimen to be an abnormal larva of the pink bollworm.

Alfalfa weevil in moss packing from Germany.--A living adult of the alfalfa weevil (*Hypera postica* Gyll.) was intercepted at San Francisco on May 10, 1937, in sphagnum moss packing for *Amygdalus* cuttings in the mail from Germany. The packing also contained a slight admixture of forest litter but

the package contained no plant material with which this weevil might be commonly associated. This interception offers a clue as to how this major pest of alfalfa may have made the jump from the shores of the Mediterranean to Utah sometime prior to 1904, when it was first reported in this country from near Salt Lake City.

Pathological interceptions of interest.--Albugo bliti (Biv.) O. Kuntze was intercepted for the first time on March 3 at New York on Amaranthus sp. from Cuba. Botrytis allii M. T. Munn was intercepted from the tropics for the first time on June 14 at Norfolk in onions from Straits Settlements. Ceratostomella fimbriata (E. & H.) Elliott was intercepted in sweetpotatoes from British Guiana on June 7 at Boston and in malanga roots from Dominican Republic June 9 at New York. Our first interception of Colletotrichum spinaciae E. & H. was made on April 13 at New York on spinach from Belgium. Elsinoe australis Bitancourt & Jenkins was intercepted at New York on May 14 and 22 on lemons from Paraguay. Our first interception of Gloeosporium apio-sporium Sacc. was made on May 14 at New York on leaves of Arctostaphylos uvae ursi from Italy. Mycosphaerella stemmatea (Fr.) Rom. was intercepted from Sweden for the first time on June 8 at Seattle on Vaccinium sp. The first interception of Pestalozzia batatae E. & E. was made at Philadelphia on June 3 in sweetpotatoes from Japan. Pratylenchus pratensis (De Man) Filipjev was intercepted from Italy for the first time on May 19 in potatoes at Philadelphia. Phytophthora citrophthora (Sm. & Sm.) Leonian was intercepted on June 23 at Philadelphia in an orange from Spain. Sclerotium sp. producing minute black sclerotia in horseradish root was intercepted at New York on June 8 in material from Germany. The first interception of Septoria anthrisci Pass & Brun. was made at Philadelphia on May 15 in Anthriscus cerefolium from Italy. Septoria megaspora Speg. was intercepted for the first time on June 9 at New York on agave from Italy. Undetermined species of Sphaeronema were intercepted at New York on January 13 in dasheen roots from Azores and at Philadelphia on May 1 in potatoes from Germany.

DOMESTIC PLANT QUARANTINES

Sweetpotato weevil control project established.--With a regular appropriation made available in the new fiscal year, the organization of a project for the control of the sweetpotato weevil is under way. T. R. Stephens is designated as field leader, with headquarters at Room 7, Gates and Cook Building, Gulfport, Miss. Mr. Stephens has been working with the Bureau for a number of years in the control and prevention of spread of the Mexican fruit fly. The principal objectives are to determine the extent of spread of the weevil and to eradicate all isolated infestations in the lightly infested areas of the commercial belt. The project will be conducted in cooperation with State officials in plant-pest control, and will be carried on in Alabama, Georgia, Mississippi, Louisiana, Texas, and possibly Florida.

Joint project for control of two peach diseases.--Activities relating to the control and eradication of the phony peach and peach mosaic diseases have been combined and will be carried as a single project. A. E. Cavanagh is designated as project leader, with headquarters at Little Rock, Ark., as heretofore, C. H. Rothe acting as assistant.

Peach mosaic situation in California.--Waivers for tree removal were signed in June by 128 owners in the areas infected with the peach mosaic disease. Removing the diseased trees, estimated at 60,000, is the all-important job in the new fiscal year. The labor crews have accordingly been increased to 500 men for the California work. From San Diego County comes the report that peach mosaic has been found in 25 additional localities. New cases have also been found in the vicinity of the known infected areas of Riverside and San Bernardino Counties. A scattered chain of light infections therefore extends from within 4 miles of the Mexican border northward to the Hemet district in Riverside County.

Peach mosaic control activities in other States.--A serious infection center was brought to light in Bryan County, Okla., in June. Inspection is accordingly being conducted, in cooperation with the State, in the vicinities of peach nurseries in four Oklahoma counties. Work in other States thus far has included the inspection of certain areas in Indiana and Missouri, of 3 counties each in Colorado, Arizona, and New Mexico, 12 counties in Texas, and 13 in Utah. More inspection is to be done in these States. Diseased, abandoned, and worthless peach trees are being eradicated with funds allotted from emergency relief appropriations.

Phony peach disease under control.--Inspection for the phony peach disease was made in June by 63 Federal and 37 State inspectors in 219 counties in 13 States. Nursery inspection is completed in Alabama, Arkansas, Georgia, Illinois, Mississippi, Missouri, North Carolina, South Carolina, and Tennessee, and reinspection is now being made of properties found infected last year, with orchard inspection to follow. Control activities of the past 2 years have progressed to the point where the outer rim of infection is being pushed back and the intensity reduced at the center.

Relief work on phony peach disease reduced.--The tree-removal project is now confined to seven States, having accomplished its purpose in Illinois, North Carolina, Mississippi, and Louisiana. The force is being reduced to approximately 200 relief persons, a reduction of more than 65 percent. A larger number of trees is being removed per man than heretofore. During the life of the project, over 64,000,000 worthless trees have been removed from over 150,000 properties in 279 counties of 11 States.

Citrus canker on the decline.--The eradication of citrus canker is believed to have been accomplished in Jefferson County, Tex., according to a report from the field leader, R. W. Dopson. A third house-to-house inspection was recently made of the old infection center at Beaumont where over 500 diseased trees were found in the winter of 1935. The eradication of these diseased trees, as well as the abandoned and escaped citrus in the vicinity, has apparently been effective in checking the canker, as no such infection has been found in the area since May 1936.

Citrus canker activities.--The work of June marked the completion of inspection and tree-removal in Mississippi covering six counties and several outlying islands; the reworking, without finding canker, of areas in Texas and Louisiana that have long showed recurrent infections; the destruction of

hundreds of valueless seedling orange trees in a noncommercial area in Texas, with the cooperation of the owners; and the working of new territory in Alabama and Florida. Several thousand acres of abandoned satsuma groves and abandoned trifoliata nurseries were recently found in Jackson County, western Florida, and 116 laborers have been assigned to remove the trees. Small crews of relief laborers are being continued in the fiscal year 1938 to work with inspectors and remove seedlings in the vicinity of old infection areas.

Transit-inspection activities.--With the seasonal decline in nursery-stock shipments, the principal articles being inspected are fruits, vegetables, cut flowers, and vegetable plants. At Chicago and other Midwest points special attention is given to refrigerator and produce cars from the areas heavily infested with Japanese beetles. No beetles have been found. Inspectors of the Bureau of Agricultural Economics at midwestern points are notifying transit inspectors daily of the arrival of any shipments of produce from the regulated areas and they have also provided information of assistance in organizing the inspection work. Within the infested areas transit inspection has been extended to the checking of shipments as to screening and covering of produce in transit, and also checking interdealer shipments as to certification requirements.

Interceptions in transit inspection.--During the month of June, over 78,000 shipments of restricted articles were inspected in transit at 12 stations, and 219 were intercepted as violations of quarantines relating to the gypsy moth and the Japanese beetle. A currant plant with the midsummer stage of the blister rust was recently caught at New York and prevented from going to a point in Kansas where white pines are grown extensively as ornamentals. Two shipments of live insects, mailed without permit, were found and reported to the responsible division. A transit inspector, while recuperating from a serious illness in New York, noted from his bedroom window that house plants were being brought into the apartment house, with household goods shipped from a foreign country. Investigation on the part of a port inspector disclosed that the plants had entered the country without permit, and they were accordingly confiscated.

White pine nurseries inspected.--Blister rust inspection has been conducted in the current field season in the environs of 61 nurseries growing 5-leafed pines, of which 15 are located in the Northeastern States, 14 in the Middle Atlantic States, 31 in the Middle West and Lake regions, and 1 in the Pacific Northwest. The zones inspected cover a radius of from 1,500 feet to a mile or more of the respective nurseries. The work is complete, except for three northern nurseries. Of special interest in the season's work were the conditions found at the Forest Service nursery at Haugan, Mont., where approximately 15 million 5-leafed pines are being raised for planting on Federal land in the Pacific Northwest. Ribes conditions around this nursery are more serious than any we have been called upon to inspect.

CONTROL INVESTIGATIONS

Insect blood-staining method.--It has been found by J. F. Yeager and J. B. Gross, of the Beltsville, Md., laboratory, that nicotine can be utilized effectively in the staining of smears of heat-fixed insect blood by the Wright technique. This nicotine modification of the usual Wright's procedure, called the Wright-nicotine-oxalic acid, or W-N-O procedure, involves diluting the Wright's blood stain with nicotine solution and later increasing the nuclear-cytoplasmic differentiation by means of oxalic acid. Most of the insect blood cell types stained in this way exhibit red nuclei and blue or blue-grey cytoplasm, which may contain various inclusions. This method is being utilized in a study of the blood picture of the southern armyworm (Prodenia eridania Cram.).

Biological disposition of rotenone after ingestion by southern armyworm.--P. A. Woke, Beltsville, reports on experiments made to determine the biological disposition of rotenone after ingestion by the southern armyworm and to determine whether any of the separate tissues of this insect might affect its toxicity. Rotenone was fed to larvae in sandwiches or was mixed with the larval tissues. Following this, after intervals of time, acetone extracts of the tissues and feces were prepared and tested against mosquito larvae for the determination of toxicity. The toxic action of rotenone for southern armyworm larvae is usually very slow and may not occur, even when excessively large doses are ingested. All or most of the rotenone ingested by the larvae is eliminated with their feces. The toxicity for mosquito larvae of finely powdered rotenone is not altered to a demonstrable extent after ingestion. The toxicity is not appreciably reduced during 18 hours of incubation in the dark at 29° C., with the various tissues and with the contents of the digestive tract.

Oxygen capacity of blood of southern armyworm.--Because the blood of many insects contains copper in rather large quantities, it has been suggested that all insect blood contains the copper-containing respiratory pigment, hemocyanin. F. H. Babers, Beltsville, has found that, although the blood of the southern armyworm contains approximately 4.9 mg of copper per 100 ml, the oxygen capacity of this blood is slightly less than that of physiological salt solution. It is quite improbable, therefore, that the blood of the southern armyworm contains hemocyanin or any other compound in sufficient quantity to act as a respiratory pigment.

Tests of high-pressure sprayers.--In cooperation with the Division of Gypsy and Brown-tail Moth Control, final tests of high-pressure sprayer units were conducted at Greenfield, Mass., from June 25 to 30, inclusive, and at Wilkes-Barre, Pa., from July 8 to 12, inclusive, under the direction of A. G. Galloway. These machines represent a group similar to the units acquired in 1936 and manufactured by the same company. Acquisition of them makes available to the gypsy moth activities a total of 22 machines capable of developing pressures up to 1,500 pounds per square inch and able to pump 40 gallons of spray mixture per minute at 1,000 pounds' pressure per square inch. Under the same cooperative agreement, a program of modernizing and conversion has

been inaugurated at Greenfield, which involves the salvaging of high-pressure spray pumps, together with all possible piping, valves, and other accessories from 10 of the sprayer machines purchased in 1927. These machines are mounted on 3-1/2-ton Federal truck chassis. The purpose of this program is two-fold in that it will eliminate a number of automotive units which have become obsolete, insofar as availability of parts is concerned, and it will result in more efficient sprayers from the viewpoint of spray pump performance. The work involved in this program is expected to continue over a period of several months.

BEE CULTURE

What is a lethal dose?--L. M. Bertholf, of Western Maryland College, working as agent for the Division of Bee Culture under a cooperative agreement, reports that apparently almost any dose of lead or calcium arsenate may be considered a "lethal" dose for honeybees. He and his students have found that a single dose which contains as little as 0.00000005 grams of the element arsenic may cause a perceptible shortening of the insect's length of life, as compared with unpoisoned controls, while a dose of 128 times this amount usually causes no apparent effect within 24 hours. It seems that, even though arsenic may not kill the bee at once, it probably injures it in some way so that the effect becomes noticeable weeks or even months after it is eaten.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Identity established for a lepidopteron feeding on green corn.--In shipments of green corn from Mexico, the quarantine inspectors of the Bureau have found on several occasions a small phycitine larva feeding in the corn grains. This caterpillar resembles that of Ephestia cautella Walk. and could be distinguished from it by little else than its larger size (when full grown). Recently we received from Brownsville, Tex., two moths reared at Matamoros, Mexico, from similar larvae. They have been identified by Carl Heinrich as Moodna bisinuella Hampson, a species close to, but distinct from Moodna ostrinella Clem., which occasionally attacks corn in the United States. M. bisinuella is a Mexican species not known to occur in this country. Until the present rearing, nothing was known of its larvae or life history.

New record of prey used by vespid wasp.--Specimens of Symmorphus debilis (Saussure) and prey, the latter removed from burrows of the wasp, were recently submitted by M. G. Perrow, director of public welfare, Lynchburg, Va. The wasp was determined by Grace Sandhouse, and the prey was identified by A. G. Boving as Chalepus sp., a leaf-mining locust beetle of the family Hispididae. In previous accounts of its habits, the prey of this wasp was said to consist of the leaf-mining caterpillar Antispila nyssaefoliella Clem.

Turtle killed by sarcophagid larvae.--Recently C. T. Greene received from G. M. Greene, of Harrisburg, Pa., a turtle which had died as the result of infestation by parasitic dipterous larvae. Twenty-one full-grown larvae were removed from the turtle and there were numerous others that had not matured. Mr. Greene identified the larvae as those of Sarcophaga cistudinis Ald.

Botfly taken from a cat.--A second-instar dipterous larva removed from the neck of a cat at Fairfax, Va., June 28, 1937, was submitted for identification and has been determined by C. T. Greene as Cuterebra sp., probably C. cuniculi Clark. Presumably the infection resulted from eating a young rabbit. The case is interesting because of the very few records of the occurrence of botfly larvae in cats.

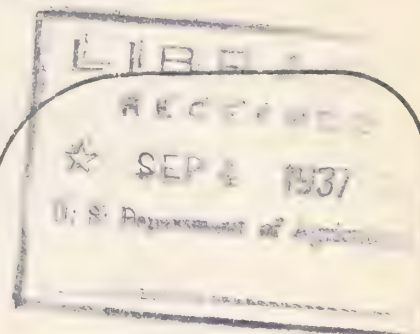
New distributional record of an ephydrid breeding in salt water.--Specimens submitted by G. N. Wolcott and reported as breeding in large numbers in the Ensenada Salt Ponds, Puerto Rico, have been identified by D. G. Hall as Ephydra gracilis Pack. This species, which sometimes occurs in enormous swarms, was first described from material breeding in Great Salt Lake, Utah. This is the first record of the species from tropical America.

A new species of chigger from Maryland.--Six partly engorged chiggers were taken last April by A. B. Gurney, of this Bureau, from a hibernating specimen of the blue-tailed skink found near Priest Bridge over the Patuxent River. H. E. Ewing has concluded that these specimens represent an undescribed species in the genus Trombicula, and has drawn up a description for publication.

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FRUIT INSECT INVESTIGATIONS

Oil sprays prevent egg laying by obscure scale.--W. C. Pierce, of the Shreveport, La., laboratory, reports that the full effect of oil sprays applied during the dormant period for the control of the obscure scale is not evident until the female scales have had time to reach maturity. Most scales that had been sprayed with oil emulsion the preceding winter appeared to be unable to lay eggs, even though apparently fully mature. A summary of the data on these studies is given in the following tabulation.

Orchard	Oil in treatment	Scales counted	Scales laying eggs
	Percent	Number	Percent
Webb-----	3	690	1.9
Do-----	2	1,880	1.3
Do-----	0	520	86.0
Fullilove---	3	420	9.5
Do-----	0	320	66.3

Lead arsenate controls May beetles on pecan.--Mr. Pierce also reports that May beetles are usually very difficult to control because of the large numbers often present. Last spring the use of frequent applications of lead arsenate as a spray, at a strength of 3 pounds in 100 gallons of water with 3 pounds of hydrated lime, gave very effective protection in pecan orchards. In most experiments four or five applications were made, but it is believed that the beetles would have been well controlled by three applications made during the early part of their feeding period. Observations have indicated that most of the protection results from a repellent action of the spray. A little foliage injury developed from five applications, but this was not at all serious.

Fluorine compounds injure peaches again.--O. I. Snapp and J. R. Thomson, Jr., of the Fort Valley, Ga., laboratory, report that fluorine compounds again seriously injured peaches this year. The injury this season, however, was not confined entirely to the tip of the fruit, as was true in 1935, but also extended to raised sutures on the side of the fruit. This was probably due to the fact that injury this year took place later in the season than that of 1935. The fruit sprayed with these

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materials was not as sweet as normal and was somewhat insipid, as compared with fruit sprayed with the full schedule of lead arsenate or derris powder. Frequent rains, such as occurred during the 4-week period following the last application this year and during the early part of the 1935 spraying season, appear to facilitate injury to peaches from the fluorine compounds. The heavy foliage on the trees this year may also have contributed to the fruit injury by shading the peaches after spraying. As in 1935, there was no foliage injury this year from the fluorine-compound sprays.

Work on filbert insects undertaken in Pacific Northwest.--A study is being undertaken of insects affecting filberts in the Pacific Northwest. This recently developed industry is suffering considerable losses from several species, including the Catalina cherry moth (Melissopus latiferreanus Wlsh.), which feeds in the nuts; an unknown species of weevil, also attacking the nuts; and the filbert bud mite (Eriophyes avellanae Nalepa), which feeds on the buds and catkins. What appear to be the first two species mentioned are also found in the acorns of native species of oaks. S. M. Dohanian has been reinstated in the service to take charge of this work.

Insect catches in mechanical revolving net.--Dwight F. Barnes, Perez Simmons, and George H. Kaloustian have submitted a report on catches of insects in a mechanical revolving net which has been operated in a Mission fig orchard near Fresno, Calif. The device used was developed at the Modesto, Calif., laboratory of the Bureau, largely by J. C. Chamberlin and F. R. Lawson, and was loaned to the Fresno laboratory for the season. The net is a rigid cone of wire cloth about 4 feet long, provided at the small end with a detachable muslin bag. The device was driven by a 1/2 horsepower electric motor and revolved in a circle 12 feet in diameter about once a second. The detachable bag was replaced every 15 minutes throughout one entire night, except for 1 hour (3 to 4 a.m.), and observations at similar intervals have been made at other times over shorter periods. Light intensities were recorded by the use of a "Weston photronic exposure meter." The temperatures during the night, when the most of the observations were made, ranged from 92° F. at 6:15 p.m. to 69° at daybreak. The dried fruit beetle (Carpophilus hemipterus L.) was comparatively scarce, but a few were captured in the early evening until the light intensity dropped below 16 foot-candles. Captures of other mitidulids increased until the light intensity dropped below 1/3 foot-candle and then continued in small numbers until about midnight. The raisin moth (Ephestia figulilella Greg.) was active throughout the night, although the greatest numbers were captured from dusk until 10:30 p.m. A beetle found in dried figs and tentatively identified as Cnemeplatia sericea Horn was captured in large numbers just at dusk when the light intensity dropped to a fraction of a foot-candle but no more of this species was captured throughout the entire night. Considerable numbers of miscellaneous staphylinids were taken, most of them just before dusk, although scattered captures were made throughout the night. As this method of trapping insects does not depend on the use of any light source or bait material, the apparatus is not selective. It probably takes a reliable sample of the insects passing the point where the equipment is placed, at the elevation of the net opening.

MEXICAN FRUIT FLY CONTROL

Fruit flies trapped in the lower Rio Grande Valley.--General rains over the area greatly benefited the citrus crop. Private sources estimate that production will probably equal that of the season of 1936-37. Only two adult Anastrepha ludens Loew were trapped in Texas throughout the month of July. The decrease in the fly population has followed the usual course, except that the two adults trapped last month are the only specimens of A. ludens ever taken in the area during July. Adult A. serpentina Wied. became somewhat common in the traps after a period of several months in which the population was at a low ebb, 59 adults of this species being trapped. The numbers of fruit flies identified during the month are shown in the following table.

Species	Texas	Mexico
<u>Adults</u>		
<u>A. ludens</u> -----	2	1
Premises-----	1	1
<u>A. serpentina</u> -----	59	1
Premises-----	45	1
<u>A. acidusa</u> Walk-----	1	0
Premises-----	1	0
<u>A. pallens</u> Coq-----	277	5
Premises-----	104	1
Total-----	339	7
<u>Larvae</u>		
<u>A. ludens</u> -----	0	*624
Premises-----	0	1
<u>A. acidusa</u> -----	0	** 48
Premises-----	0	1
<u>Rhagoletis</u> sp-----	0	** 1
Premises-----	0	1

*Of these 620 were from market fruit.

** All from market fruit.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Status of European corn borer parasites at the close of 1936.--W. G. Bradley, Toledo, Ohio, reports that surveys to determine the status of exotic parasites were conducted at the close of parasite activity in 1936. Restricted areas in the vicinity of colonization test points were surveyed by taking sample collections. The location of these points was determined by the use of polar-coordinate designs varying in type according to the objectives sought at each point. The following tables present the results of observations in the one- and multiple-generation areas in the fall of 1936.

Table 1.--Summary of parasites recovered at test points in one-generation area

[illegible]

Table 2.--Summary of parasites recovered in multiple-generation area

Locality	Foreign parasites										Native	
	Borers:	Lydella	Chelonus	Cremastus	Macro-	Total	and un-	Total	deter-	para-	mined	sites
	ob-	Inareolata:	stabulans	var.	annulipes	Wesm.	griseus	R.D.	flavo-	centrus	gifuensis	Macro-
	served:	punctoria:	var.	annulipes	Wesm.	griseus	R.D.	flavo-	centrus	gifuensis	Macro-	Centrus
	Number:	Num-:	Per-:	Num-:	Per-:	Num-:	Per-:	Num-:	Per-:	Num-:	Per-:	Num-:
	ber:	cent:	ber:	cent:	ber:	cent:	ber:	cent:	ber:	cent:	ber:	cent:
Massachusetts:												
Bridgewater-	1,448:	0:	39:	2.69	0:	0:	0:	0:	0:	0:	0:	0:
Dighton-----	1,508:	109:	7.24:	7.97	66:	4.37						
Malden-----	2,875:	355:	12.35:	74:	2.57							
Connecticut:												
E. Hartford-	665:	12:	1.80:	3:	0.45							
New Jersey:												
Atlantic-----	1,342:	3:	0.22:	4:	0.30	(2):						
Berkeley----	355:	(2):		(2):	(2):							
Maryland:												
Newark-----	74:	(2):		2:	2.70	(2):						
Virginia:												
Franktown---	377:	0:		1:	0.26	(2):						
Lee-----	705:	0:		6:	0.85	0:						

1/ Includes the following native parasites: Labrorychus prismaticus Nort., Bassus agilis (Cress.), and Zenillia cæsar.

2/No release of this species at this point.

In the one-generation area the exotic tachinid Lydella stabulans var. grisescens appeared at all test points in the vicinity of Lake Erie. In Jerusalem Township, Lucas County, Ohio, the parasites were recovered from a larger area, and the percentage of parasitized borers from a limited area near the release point was considerably higher than in 1935. Four fields within this one-generation area showed percentages of parasitization of 83.7, 69.3, 65.6, and 52.6, respectively, and an average of 28.32 percent parasitization for the area, due chiefly to the presence of Lydella. In the multiple-generation area, Lydella grisescens was obtained at all the test points at which it has been liberated in previous years. Inareolata punctoria was recovered from the older test points, with the exception of Bridgewater. Macrocentrus gifuensis appeared at two of the four points at which samples were taken and at which it had been previously released. From one field in the Dighton, Mass., survey, a locality from which this species had never previously been recovered, borers were parasitized to the extent of 20.48 percent. Colonies obtained from the outside limits of this survey indicated that the species may be present over a much wider territory than that observed in 1936. Chelonus annulipes, the egg-larval parasite imported from Italy, was recovered at Dighton, Mass., where the last release of the species was made in 1932. Twenty-eight percent of the borers in one field were parasitized. With this species also, it appears probable that the limit of distribution is well beyond the area encompassed in the 1936 survey. Cremastus flavoorbitalis was recovered from two test points on the Eastern Shore of Virginia and from Dighton, Mass. Its recovery at the latter point is important because, on the basis of former observations, it had been thought that the species could not overwinter in northern United States. Within a 7-mile radius of the oldest release point near Malden, Mass., it appears that equilibrium between the borer and its combined parasites has been reached as is evidenced by the following table.

Table 3.--Annual fall parasitization of the European corn borer in the Malden, Mass., district from 1927 to 1936

Year	Parasitization:	Year	Parasitization
	Percent		Percent
1927-----:	2.79	1932-----:	15.16
1928-----:	5.17	1933-----:	--
1929-----:	6.87	1934-----:	14.53
1930-----:	9.67	1935-----:	16.11
1931-----:	9.87	1936-----:	14.05

In order to determine the status of the tachinid Lydella stabulans var. grisescens, colonies of which have been dispersed over most of the area infested by the borer, a survey covering 37 release points located in Michigan, Indiana, Ohio, New York, and Connecticut was made. No exotic parasites were found to be on a maintenance basis at any of these points. Parasitization by native species remained negligibly low over most of the infested area. An exception was noted at certain points in northeastern Ohio, where parasitization as high as 28 percent was recorded.

Winter survival of introduced sugarcane borer parasite.--H. A. Jaynes, Jeanerette, La., found 11.11 percent of all borer stages parasitized by Lixophaga diatraeae Towns. in March in a field of sugarcane at Grand Isle in which releases were made in October 1936. No parasites were recovered in May and June, but previous findings showed that they had overwintered in good numbers, although they apparently failed to synchronize with the more or less well defined spring generations of the borer.

Burning trash decreases sugarcane borer infestation.--In studying the effect of the practice of burning sugarcane trash after harvesting, on the sugarcane borer infestation the following year, E. K. Bynum, Houma, La., made collections of borer eggs in seven experiments during April, May, and June. A total of 1,935 borer eggs were collected in plots in which the trash was burned and 3,439 eggs in plots not burned. The average number of borer stages found per acre in borer-killed plants was 62 in the burned plots and 145 in the plots not burned.

Flight-trap collections of insect vectors of sugarcane mosaic.--J. W. Ingram, Houma, reports that larger numbers per trap of all three species of known insect vectors of mosaic were collected in flight traps operated alongside a field having low mosaic spread than were collected in traps operated alongside a field having heavy mosaic spread. The three known vectors are Aphis maidis Fitch, Toxoptera graminum Rond., and Hysteroneura setariae (Thos.). These trap collections indicated that there had been no heavy flight of any of these species, also that spread must be mainly from within fields or by unknown vectors. Both trap collections and field examinations showed rather heavy flights of the aphid Hyalopterus arundinis (F.), which has not yet been found to transfer mosaic.

Losses from "pecky" rice in 1936.--W. A. Douglas, Crowley, La., recently assembled data on the amount of pecky rice listed on grading certificates obtained from the Federal-State rice-grading offices and from the American Rice Growers Association office in Beaumont, Tex. Pecky rice injury results, to a large extent, from feeding by the rice stinkbug (Solubea pugnax F.). Based on samples from 13 percent of the rice grown in Louisiana, Texas, and Arkansas, 60 percent of the rice produced during 1936 had less than 2 percent pecky, 29 percent had from 2.1 to 4 percent, 8 percent had from 4.1 to 7 percent, 2 percent had from 7.1 to 10 percent, and the remaining 1 percent had over 10 percent pecky rice. Losses based on the average of deductions for pecky rice, used in the Bureau of Agricultural Economics grading system, amounted to \$589,000. The average losses for the period 1930-33 were estimated at \$535,000.

Successful fumigation of bagged rice with HCN.--R. T. Cotton, Manhattan, Kans., reports that two and one-half million pounds of rice stored in a warehouse of 100,000 cubic feet capacity, was successfully fumigated with liquid hydrocyanic acid. A dosage of approximately 2-1/2 ounces of liquid HCN per ton of rice was used with an exposure of 72 hours. Six thousand adults of the rice weevil confined in check boxes and placed inside bags of rice throughout the large stacks were all killed.

Effects of fumigation on popping quality of corn.--Mr. Cotton, Geo. B. Wagner, and H. D. Young, Manhattan, report that an investigation of the effect of our common stored-grain fumigants on the popping quality of popcorn revealed the fact that the vapors of HCN improved the popping quality, but that the vapors of ethylene dichloride, chloropicrin, carbon tetrachloride, and heavy dosages of carbon disulphide temporarily had a bad effect on the popping quality of corn.

Differential feeding by variegated cutworm.--H. H. Walkden, Manhattan, reports that in June an outbreak of Lycophotia saucia Hbn. occurred in the sweetclover plots of the Kansas State Experiment Station. It was noted that some varieties were more seriously injured than others. The amount of injury was rated for each of 28 varieties of sweetclover, on the basis of percentage of defoliation. It was found that, in general, the white-bloomed varieties were less severely injured than the varieties having yellow blooms. The percentage of defoliation ranged from 25 to 82 in the white varieties, whereas in the yellows the range was from 58 to 90. There is apparently a definite relation between the blooming date and the amount of defoliation, the early varieties being more severely damaged than the varieties maturing later.

Development of hessian fly infestation on grass.--E. T. Jones, Manhattan, reports that recently summarized data obtained in greenhouse tests indicate that species of all genera of wild grasses of the tribe Hordeae except Lolium may support hessian fly infestation. As many of these grasses occur in nature either among wheat or adjacent to wheatfields, they are potential factors in hessian fly control.

Fly-resistant hybrids less resistant to stem rust than certain other wheats.--Mr. Jones also reports: "In our Springfield, Mo., tests, 294 rows of F_4 and F_5 Marquillo x Winter wheat fly-resistant selections, representing 6 crosses, have been discarded on the basis of our fly-resistance records and agronomic data--rust- and bunt-resistance records obtained by agronomists and plant pathologists of the Bureau of Plant Industry and the Kansas Agricultural Experiment Station. One hundred and twenty-two rows of desirable selections have been examined for fly infestation. Fall infestation of these rows averages less than 0.6 percent, as compared to an average of 84.5 percent infestation for parental strains of winter wheat in the same test. Based on examination of 28,466 stems, the average spring infestation was only 1.6 percent, with a range of 0 to 2.9 percent. Average infestation of parental checks in the same test was 33 percent, with a range of from 24 to 52 percent. Although these selections are resistant to fly and relatively resistant to rust, many of them, when artificially inoculated in a comparable test conducted by C. O. Johnston, appeared less resistant than Hope and H-44 hybrids. The less resistant selections will be discarded."

Stage of plant growth as a factor in hessian fly infestation.--Mr. Jones says that plants of strains of winter wheat resistant to infestation by fall broods and by the first spring-brood flies were susceptible to infestation by second spring-brood flies. Since development of the first three broods mentioned generally occurs while the plants are in the rosette stage and

development of the second spring brood is coincident with the jointing stage of growth, this appeared to be a factor in the peculiar reaction of the plants to infestation. Both rosetted and jointed plants were infested under a single cage. In this test 68 percent of the jointed plants and only 33 percent of the rosetted plants were infested. With a comparatively lower infestation of eggs observed on the older jointed plants, this difference is significant. In the same test, plants from seed produced by fly-free and by infested plants from the same resistant lines, under conditions of heavy natural infestation in 1936, were found to have no material difference in infestation. Resistant F₅ selections from crosses of Marquillo with 5 varieties of winter wheat were used in the test.

Fly-infested wheat recognized by means of parasite-emergence holes.--According to Mr. Jones, emergence holes of the hessian fly parasites Merisus destructor Say and Eupelmus allynii French have afforded an excellent means of quickly recognizing and eliminating infested plants in the field. From a series of 120 rows, 8 feet long of F₂ Marquillo hybrids in our Springfield, Mo., test plots, a great mass of undesirable infested material has thus been discarded.

Tests of rye for hessian fly resistance.--Mr. Jones reports that of 14 commercially important varieties of winter and spring rye, pot-tested for resistance to hessian fly development, all were found susceptible to infestation except a selection of Balbo spring rye from the University of Tennessee. Although the rye infestation of the Marquillo wheat checks ranged from 27 to 29 percent, Ceres checks from 75 to 96 percent, and the 13 strains of rye from 7 to 64 percent, no larvae developed on this strain of Balbo. Five commercially desirable varieties of barley in the same test were found to be uniformly susceptible to infestation.

Parasite cocoons shipped to Canada.--C. C. Hill, Carlisle, Pa., reports that in April 3,300 cocoons of Heterospilus cephi Rohw., collected in Bucks County, Pa., were shipped from Carlisle, Pa., to A. B. Baird, Belleville, Ontario, for colonization in the biological control of sawflies by the Canadian department of agriculture.

The vetch bruchid in North Carolina.--J. S. Pinckney, Carlisle, reports that the population of vetch bruchid in the 1937 crop of seed is much lower than it has been for the last two seasons. The maximum infestation found was 65 percent, with a minimum of 9 percent and an average running about 30 percent. Two factors seem to have caused this condition--the rapid maturity of the crop, and the fact that many of the earliest set pods, which received the major portion of the egg deposition, failed to mature and produce seed. It is also noteworthy that most of the infested seed that came to the cleaning mills contained dead forms of various stages of the bruchid and such seed is producing few living adults. One factor causing this was the rapid hardening of the seed content which seems to have caused the death of many of the first-, second-, and third-instar larvae through their inability to consume the hardened seed material. Many of the advanced stages of the insect were found dead because of their apparent inability to withstand the threshing and cleaning process. This was not the case during the last two years.

Hymenopterous parasite in wheat sawfly control.--Mr. Hill states that in further experiments in the biological control of the wheat sawflies 5,100 adults of Collyria calcitrator Grav. were liberated this year by E. J. Udine in parts of Pennsylvania and Ohio. These were received from Mr. A. B. Baird of the Canadian Department of Agriculture.

JAPANESE BEETLE CONTROL

More confirmations near Cumberland, Md.--Early in July a Dutch elm disease confirmation was received from the laboratory covering a first-record infection at Wileys Ford, W. Va., near the Western Maryland Railway tracks and the Potomac River, south of Cumberland. Two additional trees in this section were confirmed the following week. One was near the first infection found and the other about 6 miles distant but still near the Western Maryland tracks and the Potomac River. A single confirmed tree was found at Cumberland in September 1936.

Dutch elm disease found in an English elm.--In New York an English elm, showing no external symptoms of the disease except a stag-headed condition and faint discolorations, after persistent sampling, was confirmed as infected. Instructions were issued to New York scouts to sample all English elms, regardless of their condition, samples to be submitted to the laboratory for culturing.

Traffic squad organized.--Two Dutch elm disease employees have been designated as a traffic squad to check on the speed and care exercised by drivers of the Division's motor-vehicle equipment. They are provided with traffic violation tickets and stubs. Men caught violating traffic laws are required to report to their county supervisors for disciplining.

Infection in Passaic County, N. J., traced to infested elm logs.--Scouts surveying in the vicinity of 13 elms confirmed in a small area in Passaic County, found a large pile of wood, including many elm logs, in an adjacent yard. These logs were found heavily infested with elm bark beetles. Discoloration typical of Dutch elm disease infection was also noted in some of the logs.

New infestation of European elm bark beetle discovered.--An elm log infested with Scolytus multistriatus Marsham was found in the Ohio River near Mount Vernon, Ind. An infestation of this species was later located on the Indiana side of the Ohio River, opposite the junction of the Green River.

Seasonal quarantine activities at a peak.--Two hundred empty refrigerator cars per week were fumigated at Baltimore, Md., during most of July. In the New York City area it was necessary to add 19 additional temporary inspectors for nursery and greenhouse scouting, farm-products inspection, and the fumigation of refrigerator cars. Following the finding of infestations at certain Eastern Shore inspection points, shippers were required to load refrigerator cars through heavy canvas flaps nailed to and overlapping the loading door. The opposite door was screened. Transit inspectors in

Chicago and other midwestern terminal markets reported a few instances of living Japanese beetles reinfesting cars that had been fumigated and loaded under protected conditions. This was probably due in some instances to breakage of the screens from the weight of cinders from the locomotive. Another possible means of infestation which was closely watched was in conjunction with reicing at Clayton, Del., and Enola, Pa., where heavy flights of the beetle were in progress during July. Fumigation of banana refrigerator cars was started in the New York City area on July 6. This is the first year that such a procedure has been necessary in the metropolitan district. Although these cars are loaded with fruit at New York City piers, most of the prefumigation is done in the various freight and cleaning yards on the New Jersey side of the Hudson River. During July two banana companies prefumigated 1,422 cars under supervision. In addition, 11 cars loaded with bananas were fumigated at New York City piers. Each company has a different method of fumigation.

Beetles more numerous in New York City area.--Conditions of infestation in the five boroughs of New York City and nearby Westchester and Nassau Counties, N. Y., were reported worse this year than in any previous season. Numerous requests for information concerning control of the beetle were received at the New York City office. Metropolitan newspapers devoted considerable space to articles concerning the Japanese beetle and the damage done by it. One of the New York City inspectors investigated a report of beetles damaging flowers in a penthouse garden on top of a 12-story office building. In constructing this miniature garden of about 5,000 square feet, the landscape workers had apparently used either soil or sod containing Japanese beetle larvae. The custodian purchased a number of beetle traps and at last reports these traps had caught about 50 beetles.

Farm-products inspection in Maryland.--To meet an emergency situation in the Baltimore area involving the necessity for hand inspection of many carloads of the first picking of string beans, E. N. Cory, State entomologist, arranged for the assignment of 28 W. P. A. workers to the farm-products inspection corps in the Baltimore market. Shippers objected to the use of bean inspecting machines, claiming that the beans were damaged during their passage through the machines. When the second picking of beans started moving to distant markets, machine inspection was restored, as the latter picking was more mature and could be ridded in the machines without injury. Each machine is now equipped with metal guards of galvanized iron to protect moving parts.

Infestations in New York Harbor.--Heavy infestations of Japanese beetles exist on the islands in New York Harbor. Trapping at Fort Jay on Governor's Island netted 2 gallons of beetles daily during July. Little foliage damage was apparent, owing largely to the timely setting and baiting of traps. Fort Wadsworth, on nearby Staten Island, showed considerable foliage feeding, although the infestation was lighter at that point. Traps for control were not set at Fort Wadsworth until beetle emergence was well under way. One hundred traps are operated at each of these army posts. There have also been reports of beetles flying aboard ship as the steamships pass in and out of New York Harbor through The Narrows.

Experiments with methyl bromide fumigant continued.--In cooperation with the Division of Control Investigations, trials with methyl bromide as a fumigant have been continued with snap beans. Potato shippers, who are decidedly opposed to the use of hydrocyanic acid gas, are somewhat interested in methyl bromide as a fumigant. Results appeared to be encouraging.

"Bag the beetle days"--The Mayor of Harrisburg, Pa., proclaimed 2 days in July as "Bag the beetle days." Ten cents per pint was offered to all collectors who obtained their beetles within the city. Over \$150 was paid out during the 2 days and collections were estimated at 2,000,000 beetles.

Southern Japanese beetle trapping concluded for the season.--All traps set in States south of Virginia had been lifted by the end of July, with the exception of those in one city in Kentucky, where a few beetles persisted from last year's incipient infestation.

Current trapping activities.--Japanese beetle trapping, still in progress at the end of the month, extended to traps set in 219 cities and towns in 13 Northern States. The numbers of cities and towns trapped in the respective States were as follows: Illinois, 10; Indiana, 11; Iowa, 1; Kansas, 1; Maryland, 83; Michigan, 6; Missouri, 14; Nebraska, 1; New York, 15; Ohio, 47; Pennsylvania, 13; West Virginia, 14; and Wisconsin, 3.

Beetle population in Philadelphia again at a minimum.--Parks, open squares, and markets near the Philadelphia river front are comparatively free from Japanese beetle infestation for the second consecutive year. These are the areas in which the adults formerly swarmed in large numbers. Sailors docking at Philadelphia reported that adults flew aboard ship at New Castle, Del., as early as July 13.

Moth infestations in all stages.--During July all stages of the gypsy moth were found by district inspectors examining quarantined products prior to certification. From six infested shipments inspected at Deering Junction, Maine, there were removed 2 egg clusters, 24 larvae, 6 pupae, and 1 female moth. Throughout the 18 districts a total of 7 egg masses, 39 larvae, 31 pupae, and 1 adult moth were removed from 16 infested lots of forest and quarry products submitted for inspection.

FOREST INSECT INVESTIGATIONS

Many trees defoliated by borer beetles.--Thousands of American elm trees and other species have been defoliated by adults of the flatheaded apple tree borer in the vicinity of Lincoln, Nebr. N. D. Wygant, of the laboratory at Fort Collins, Colo., reports that the beetles chew off the bases of the leaf petioles. They also chew off many of the buds and girdle the new twigs. The insect built up a tremendous population during the drought years, but this is the first season that it has been numerous enough to cause any damage in the adult stage. The preferred hosts are American elm, pin oak, pear, and cherry. Orchards in the vicinity that were sprayed with lead arsenate are free from injury by the adults. The borers developing from the eggs deposited by these beetles are a real threat to the trees already weakened by the drought and by defoliation.

Pine bark beetle survey under way.--According to F. P. Keen, of the Portland, Oreg., laboratory, a region-wide pine beetle survey is now in full swing in the Pacific Northwest. Under plans prepared and supervised by Bureau personnel, the Forest Service and Indian Service are cooperating in an effort to inspect all of the important ponderosa pine forests of the region, covering about 3,000,000 acres. Under the E. C. W. program, the Forest Service has assigned 18 student assistants and 5 crew leaders to this work; the Office of Indian Affairs is organizing a field crew for each of the 3 large Indian reservations in the region; and the Bureau has 1 crew studying beetle damage on cut-over lands.

Douglas fir beetle affects salvage in Tillamook Burn.--An outbreak of the Douglas fir beetle caused heavy group killing in 1935 in green timber near the Tillamook Burn, in Oregon. The outbreak, according to R. L. Furniss, of the Portland laboratory, subsided to a negligible extent in 1936. Beetle-killing of trees was so extensive during the 1-year "flare-up", however, that logging operators have now concluded that it will be necessary to begin salvage in the large block of unburned timber located in the center of the burn. This entails a change of plans. Originally it had been intended that the unburned timber could be held in reserve until salvage of fire-killed trees became unprofitable. The new development will probably reduce the total amount of burned timber than can be salvaged from the 10,250,000,000 board feet that were killed in 1933.

Parasites of the satin moth doing effective work.--Mr. Keen reports that parasites introduced into Washington by the Bureau between 1929 and 1934, to aid in the control of the satin moth, have become well established. These introduced parasites, together with native parasites and wilt disease, have so reduced the satin moth population in Washington that no conspicuous defoliation occurred this year. The only heavy outbreak observed was found near Monmouth, in the Willamette Valley of Oregon, near the southern limit of known infested territory. In this outbreak the moths had evidently advanced ahead of the parasites. This introduction of satin moth parasites has been so successful that this pest has practically been reduced to the status of a native insect.

Willow trees of the Pacific Northwest seriously menaced.--Mr. Keen also states that the poplar and willow borer has arrived in Oregon. It first came to our attention in July 1933, when it was discovered by J. A. Beal, infesting native willows along the Columbia River at Portland. Now, 4 years later, infestation has spread over a wide area surrounding Portland, and it appears likely that all of the susceptible willows and poplars throughout the State will be badly riddled or killed by it unless some natural control can be made effective. The infestation is already so widespread that artificial control appears out of the question, except at a cost that would be excessive.

The eastern spruce beetle.--Control of the eastern spruce bark beetle by the tree-injection method, using copper sulphate in solution, is being employed on freshly attacked trees on the Green Mountain National Forest in

Vermont. W. D. Bedard, of the Coeur d'Alene, Idaho, laboratory, spent several weeks in Vermont lining up the project, and J. V. Schaffner, of the New Haven laboratory, will carry it forward.

Large trees more favorable to mountain pine beetle.--Mr. Bedard also reports that there are more mountain pine beetles produced per square foot of bark in trees of large diameter. In an examination of 211 western white pine trees infested with the mountain pine beetle, all trees ranging from 13 to 40 inches DBH contained approximately an equal quantity of brood per square foot of bark surface; trees 11 and 12 inches DBH contained three-fourths of this amount; while trees less than 10 inches in diameter contained only one-fourth as much brood as did trees over 12 inches DBH.

Tree diameter Inches	Bark surface Square feet	Average per square foot		
		Brood Number	Parasites Number	Predators Number
6-10-----	1,096	3.0	5.4	0.7
11-12-----	2,316	6.1	11.9	1.1
13 or over--	21,905	8.3	3.6	3.4

It was also found that parasites were most abundant in the smaller trees, while the reverse was true regarding predators. In trees 12 inches or less in diameter there were 9.8 parasites and 1.0 predator per square foot, whereas trees over 12 inches DBH contained 3.9 parasites and 2.6 predators per square foot. These facts are of value in determining the relative importance of infestations in different areas.

Rearing bark beetles at Morristown.--C. W. Collins reports that the Morristown, N. J., laboratory has a basement room where adults of the smaller European bark beetle (Scolytus multistriatus Marsh.) and the native elm bark beetle (Hylurgopinus rufipes Eich.) are reared for experimental purposes. The room measures approximately 11 by 15 by 8 feet in height and is tightly constructed to prevent the escape of beetles. It is entered through a vestibule which has two doors. One door allows one to enter the vestibule from the basement and the other allows one to enter the room from the vestibule. The temperature of the room ranges from 70° to 80° F. throughout the year. A radiator connected with a small stove is used to raise the temperature when necessary. The beetles are reared in metal containers placed on shelves which are movable so as to accommodate containers of different heights. A total of 100,000 beetles per month is sometimes obtained.

Parasites.--P. B. Dowden and P. A. Berry, New Haven, report as follows on the rearing and dissemination of Compsilura concinnata Meig. and Ephialtes examiner F.: "A total of 12,310 puparia of Compsilura concinnata were recovered from larvae of Porthetria dispar (L.). All but a few hundred issued from about 80,000 larvae collected at Cranston, R. I., and held in rearing trays at Taunton, Mass., by J. E. R. Holbrook and L. D. Casey. One thousand puparia were sent to the Canadian Parasite Laboratory, and 11,310 were held at New Haven for adult emergence. Approximately 9,500 adult flies issued at

the New Haven laboratory (the males not counted). The flies were held in mating cages as they issued and 2,330 pairs were removed while mating. There were 1,685 females that may have been fertilized but were not observed mating, and 738 that were injured or died. The flies were liberated at two points. The first lot, consisting of 985 mated females, was sent to J. C. Evenden at Shoshone, Idaho, and released in a heavy infestation of the fir tussock moth (Hemerocampa pseudotsugata McD.) on the Sawtooth National Forest. Only 9 flies died en route. The second lot, consisting of 1,230 mated females, 1,618 possibly mated females, and 1,992 males, was sent to L. W. Orr, Cass Lake, Minn., and liberated in heavy infestations of the forest tent caterpillar (Malacosoma disstria Hbn.). Mortality was considerably higher in the second than in the first shipment, 266 males and 365 females dying en route. This was undoubtedly due to the fact that some of the flies were several days old at the time of shipment." From 250 overwintering females of Ephialtes examiner, 13,716 females were reared in the laboratory this summer on the ugly nest tortricid (Cacoecia cerasivorana (Fitch)). A high percentage of these females were mated. The following liberations were made: At Meriden, Conn., 1,000 females in infestations of pine shoot moth; at Boonton, N. J., 500 females on pine shoot moth; at Shoshone, Idaho, 2,000 females on fir tussock moth; and at Cass Lake, Minn., 3,000 females on forest tent caterpillar.

Spraying by autogiro.---S. F. Potts, New Haven, reports that 8 plots were sprayed from an autogiro at Whitesbog, N. J., making a total of 15 thus far this season. Foliage from the plots is being fed to larvae of the striped oak worm (Anisota senatoria (S. and A.)). Foliage is being collected for analysis before and after various amounts of rain to determine the degree of adherence. Determination of the effect of spreaders and oils and the distribution, size, and number of spray drops per given leaf area is being determined.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Regularly patrolled burlap bands efficient in thinned areas.---In patrolling burlap bands it has been observed that many more gypsy moth caterpillars are located and destroyed in areas where thinning work has not been done than in areas where it has been performed. This is partly due to the reduced caterpillar population in thinned areas, caused by the destruction of many egg clusters during the burning of slash and debris. The value of burlapping as a means of controlling the gypsy moth is demonstrated by the marked decrease in the numbers of caterpillars and pupae found under the bands as the season progresses.

Female pupae collected for assembling cage work.---More than 806,500 female gypsy moth pupae were collected in Franklin, Hampshire, and Hampden Counties, Mass., and in Windsor County, Vt., and they were placed in trays in a specially prepared room in the storehouse in Greenfield, Mass. The moths that emerged from these pupae were used in making the attractant material for assembling cage work. Material for more than 7,000 cages was obtained from this pupal collection. A number of assembling cages were set out in New York, New Jersey, and Pennsylvania.

Sawdust mill ready for work in woodlands.--A sawdust mill powered by a V-8 motor and fitted with dual tires was recently assembled at the storehouse in Greenfield, Mass. The unit will be used to convert brush into coarse sawdust or small chips in connection with gypsy moth thinning work in areas where the accumulation of such slash might become a fire hazard. The mill can blow the sawdust or chips into one large pile or broadcast it over a wide area, as desired.

Interest in work stimulated by visit to heavily infested area.--W. P. A. workers in the Massachusetts section of the barrier zone were transferred to Northampton, Mass., for 1 day in July and were given an opportunity to see the gypsy moth in its various stages. Many of these men never before had seen gypsy moth defoliation.

Several infestations apparently eliminated in Pennsylvania.--To date, no caterpillars or pupae of the gypsy moth have been found at the sites of infestations discovered during the last fiscal year in the townships of Clinton, Dyberry, and Lake in Wayne County, Jefferson and Ransom in Lackawanna County, and Chestnut Hill in Monroe County.

New infestation found by former W. P. A. employee.--A former W. P. A. gypsy moth worker, now employed by the Delaware, Lackawanna, & Western Railroad Company, observed a gypsy moth egg cluster while working along the railroad right-of-way near the Coolbaugh-Paradise Township line in Monroe County, Pa. He reported his discovery to the field supervisor in charge of that district, and numerous caterpillars were found later in a rather restricted area. Intensive treatment work will be applied in an effort to eradicate the infestation as soon as possible.

Pennsylvania gypsy moth quarantined area revised.--The third revision of the State of Pennsylvania quarantine on account of the gypsy moth became effective on July 1, 1937. Changes were of a minor nature, except for the inclusion in the quarantined area of the township of Clifton, in Lackawanna County.

Overabundance of deer adds to gypsy moth inspection work.--A considerable number of 12-foot hardwood poles was inspected for the gypsy moth in the Pennsylvania area. These poles will be used in the erection of fences to prevent deer from destroying crops on certain farms where these animals have done much damage.

Summary of C. C. C. gypsy moth work for the fiscal year 1937.--During the fiscal year 1937, C. C. C. men worked approximately 282,500 man-days of 6 hours each on gypsy moth control measures east of the barrier zone in Massachusetts, Connecticut, New Hampshire, and Vermont. The men examined about 1,068,600 acres, 1,437,700 isolated trees, 50,200 yards of stone walls, and 2,800 miles of roadsides. Over 5,915,000 new gypsy moth egg clusters were creosoted. Incomplete records show that over 1,848,500 trees were banded with burlap, resulting in the crushing of more than 8,861,800 gypsy moth caterpillars and 138,900 pupae.

Slight increase in numbers of C. C. C. gypsy moth employees.--The numbers of C. C. C. men assigned to gypsy moth work in Massachusetts and Connecticut were increased slightly during the week ended July 24, but were decreased somewhat in Vermont. The total of 672 men were distributed as follows: 355 in Massachusetts, 143 in Connecticut, and 174 in Vermont. The men have been used principally in tending burlap, in burning brush, and in thinning work. Scouting was started at two camps in Vermont.

Severe defoliation in many parts of the infested area.--Several small infestations, ranging from 2 to 8 acres, consisting principally of poplar and oak, and where the trees were 50 to 100 percent defoliated, were inspected by gypsy moth officials in charge of C. C. C. work at Russell, Mass. This is the farthest west that any severe gypsy moth defoliation has ever occurred in Massachusetts, and the areas will receive intensive treatment. A large area in Northampton, Mass., also suffered severe defoliation. More defoliation than has previously occurred is being found west of the Connecticut River. A few Connecticut River towns in Vermont contained defoliations ranging from 20 to 100 percent on a large isolated white oak tree in the town of Rockingham. Several small areas in Granby, Conn., are defoliated approximately 50 percent. The gypsy moth foremen in the C. C. C. camps have been supplied with blue-print tracings of the towns in which they are working, and they are locating on the maps the areas that showed defoliation.

Progress of gypsy moth pupation varies in different States.--C. C. C. crews destroyed approximately three times as many gypsy moth pupae and female moths as caterpillars in Massachusetts during the week ended July 24, which indicates the approach of the end of the caterpillar season in that State. This high ratio is undoubtedly influenced by the presence of heavy infestations, where lack of food induces pupation earlier than in areas where food is plentiful. Approximately equal numbers of caterpillars and pupae were destroyed in Connecticut and moths were just beginning to appear. Considerably more caterpillars than pupae were found in Vermont during this period, and only a few moths were killed. Examination of some burlapped areas indicate that the burlapping work this year has been slightly less effective than normal, due to much rainy and cool weather during the caterpillar season.

Field day to be held at Westfield, Mass.--A visit was made to several infestations that are being worked from the Westfield, Mass., C. C. C. camp, in company with the E. C. W. forester who is cooperating with C. C. C. gypsy moth work in that section. Plans were made for a field day to be held on September 2 at that camp. The attending group will visit several locations where thinning work has been done, and other areas have been marked for later cutting and for discussion at the meeting.

PLANT DISEASE CONTROL

Blister rust increasing on young pine in St. Joe National Forest.--A recent examination of an excellent stand of western white pine reproduction in the Bird Creek Drainage in the St. Joe National Forest in Idaho showed that the trees had been severely attacked by blister rust. In places as

high as 70 percent of the trees were infected, although the average for the entire drainage will probably not exceed 20 percent. The principal species of Ribes that have been spreading the disease are R. viscosissimum and R. petiolare.

Notes from the North Central region.--The discovery of infected Ribes nigrum in Fairfield County, Ohio, extends the range of known blister rust infection 60 miles farther south in the central portion of the State. Other infection centers on both pine and Ribes were reported from several States in the region, but in each instance from counties previously reported as infected. The telial stage of infection on Ribes was reported almost unanimously by the field personnel as first appearing about July 15. The one exception was the finding of a few telial columns in west-central Wisconsin on June 25. In July one of the infection study areas in the Upper Peninsula of Michigan was destroyed through the clear cutting of 160 acres of white pine timber, ranging from pulpwood size to saw timber.

White pine surveys in southern Appalachian States.--White pine surveys were continued during July in Georgia, North Carolina, Tennessee, and Virginia, the work being carried on at the same time as the Ribes-eradication work. Surveys were made in 19 counties and 24,641 acres of pine classed as worth protecting from blister rust was mapped.

Blister rust control work in Northeastern States in May and June.--As a result of 74,563 man-days of employment, over one-quarter of a million acres was cleared of 7,173,934 wild Ribes and 8,399 cultivated bushes. Over 83 percent of the total acreage brought under control was worked by men employed on the W. P. A. and E. C. W. programs. Pine and control-area mapping was conducted in 67 townships in New Hampshire, Connecticut, New York, and Pennsylvania. A total of 31,246 acres was mapped and 9,307 additional acres was examined but not mapped, owing to lack of sufficient pine to justify the cost of control. Sixty-four miles of control area boundary lines was painted in the field. This mapping project required 1,787 man-days of labor. In Pennsylvania, E. C. W. personnel was used for 256 man-days in locating and cutting out blister rust infections in State-owned white pine plantations. A total of 106,502 trees were examined and 720 fatally infected pines cut down. In addition, 6,019 branch infections and 787 trunk cankers were removed. A small amount of Ribes nigrum elimination work was performed in one township in New York, and a pine-infection survey was made in five Connecticut townships. At North Hudson, N. Y., permanent plots were reexamined by Dr. Rusden, with the aid of one assistant and eight laborers, to determine Ribes and pine-infection conditions.

Stem rust development in the spring-wheat area.--On August 5, E. C. Stakman, in charge of rust surveys, briefly summarized the stem rust situation in the spring-wheat States as follows: "Although the rust epidemic of 1937 was extremely destructive in the spring-wheat region, it was not so devastating as that of 1935. The most extensive damage was done in northeastern South Dakota, particularly the Whetstone Valley, in west-central Minnesota, and in southeastern North Dakota. In this area most of the

acreage was sown to susceptible varieties, and it now seems probable that the damage for this area is likely to be 70 percent. Northward as far as Fargo, N. Dak., and Moorhead, Minn., the average damage is likely to be about 60 percent, with considerable local variation. Northward and westward the average damage to susceptible bread wheats will probably be somewhat less. In most localities considerable good wheat will be produced, while the damage will be heavy in others. (In much of Minnesota a large proportion of the acreage consists of rust-resistant varieties, which are largely escaping damage.) The condition of durum wheats varies greatly in different localities. In the worst rust area of northeastern South Dakota and southeastern North Dakota, many fields of durum have 100 percent of rust (each of the plants in such fields has one or more pustules), and the damage will be heavy. In the principal durum-growing area of North Dakota there is extreme variation. Some fields were ripe on August 1, others were still grass-green and in the milk stage. Because of abundant rains, rust has developed rapidly and is likely to attain maximum development on the late fields. It seems likely that about 30 percent of the fields will escape severe damage, about 40 percent of them are uncertain, depending on weather, and about 30 percent are still so green that they are likely to be very severely damaged.

Stem rust in Nebraska.--Marion E. Yount, State leader of barberry eradication in Nebraska, reports that large barberry bushes found near Hastings on May 23 were carrying heavy aecial infection. It is believed that the bushes had been shedding spores abundantly for many days before they were found. Stem rust readings made over the surrounding area indicate a distinct tapering off of rust infection as sectional readings were made to the east, west, and south, from the barberry location. The dominant zone of stem rust infection extended approximately 15 miles to the northward. Owing to the variation of seasonal conditions, it is difficult to determine just how far the rust spread from these bushes. Later as physiologic race identifications are completed, additional evidence will be available concerning this point.

Effective work done by local labor in Iowa.--In summarizing eradication progress made with crews of local men employed with emergency funds, D. R. Shepherd, State leader in charge of barberry eradication work in Iowa, states that men who are known to the property owners have a distinct advantage in carrying out this project. Work conducted with emergency funds in Iowa since August 1935 may be summarized as follows:

Bushes destroyed-----	29,157
Properties cleared-----	1,529
Square miles surveyed-----	12,276
Man-months of relief labor-----	3,588.61
Man-months of nonrelief labor-----	294.26
Tons of salt used-----	135
Counties in which work was done-----	44
Men who worked one or more days-----	689
Maximum number of men employed (June 1-15, 1936)----	294
Average number of men employed (1936)-----	234

Rust spreads from barberry bushes in Iowa.---During the spring of 1937 stem rust was observed spreading from barberries to nearby grains and grasses in Buchanan, Chickasaw, Delaware, Dubuque, Lee, and Story Counties. In Story County a severity of 25 percent was observed on quack-grass at a time when it was difficult to find stem rust on grains or grasses some distance from barberry bushes.

COTTON INSECT INVESTIGATIONS

Cotton flea hoppers and boll weevils caught on screens.---Data on the abundance and migration of cotton flea hoppers as determined by the catch on tanglefoot screens is reported by K. P. Ewing and R. L. McGarr, of Port Lavaca, Tex. The total catch from April to July on 12 comparable 3 by 3 foot screens set with the lower edge 3 feet from the ground, during the last 5 years was 6,752 flea hoppers in 1937, 2,188 in 1936, 5,321 in 1935, 10,967 in 1934, and 12,501 in 1933. The 1937 catch on the sides facing the different directions were 811 flea hoppers on the north side, 870 on the south, 2,069 on the east, and 3,002 on the west. The catch on another series of screens set at different heights was 331 flea hoppers at the 3 to 6-foot elevation, 303 at the 9 to 12 foot elevation, 249 at the 15 to 18 foot elevation, and 298 at the 21 to 24 foot elevation. On revolving screens that always face the wind, the catch was 169 flea hoppers on the windward side and 170 on the leeward side. As in 1936, during April and May more flea hoppers were caught on the windward side and during June and July more were caught on the leeward side. The catch was slightly greater on two comparable stationary screens (934) than on two revolving screens (876). The number of boll weevils caught per stationary screen at Port Lavaca from April to July, inclusive, was 28 in 1937, 2.5 in 1936, and 1.5 in 1935. At Tallulah, La., G. L. Smith reports that 15 weevils per screen were caught in 1937, 10 in 1936, and 21 in 1935. At Florence, S. C., F. F. Bondy reports that 12 weevils per screen were caught in 1937, 6 in 1936, and 0.5 in 1935, during the same months.

Boll weevil survival in 1937.---For the last 6 years data on the survival of hibernating boll weevils under comparable conditions has been obtained at Florence, S. C., by F. F. Bondy, at Tallulah, La., by R. C. Gaines and associates, and at College Station, Tex., by R. W. Moreland. These data are useful as an index of the mortality caused by different climatic conditions, the time of emergence, and the expected abundance in different sections the following spring. Screened cages 4 by 4 by 4 feet containing Spanish moss and cornstalks for shelter material, in which 500 weevils per cage are placed, are used. Installations are made on October 15, November 1, and November 15. Usually 70 cages, or 35,000 weevils, are installed at each locality. Weevils that are active in the spring are removed daily after cotton is available for food, about the first week in May. The percentage of weevils surviving during the last 6 years has been as follows:

Year	: Florence, S. C.	: Tallulah, La.	: College Station, Tex.
	: <u>Percent</u>	: <u>Percent</u>	: <u>Percent</u>
1932-----:	3.95	18.39	4.12
1933-----:	7.07	0.15	0
1934-----:	0.04	7.51	3.22
1935-----:	0.71	0.10	0.25
1936-----:	0.007	0.17	2.40
1937-----:	7.03	11.87	6.24

The survival at Florence was equal to the previous high record in 1933, at Tallulah it was the highest since 1932, and at College Station it was the highest recorded since the series was started in 1932. The last emergence occurred on July 12 at Florence, on July 23 at Tallulah, and on June 19 at College Station. The period of emergence this year extended over a much longer time than usual at Florence and Tallulah, but was more nearly normal at College Station.

Development of squares in cotton.---E. W. Dunnam and J. C. Clark, of Stoneville, Miss., in their studies of varietal resistance of cotton to boll weevil determined the length of time from the formation of squares to the opening of blooms. This is the time when the greatest weevil damage occurs and is ordinarily the period during which protection from weevil attack is needed. In the 44 commercial varieties studied, the average number of days required from small squares, just large enough to detect, to blooming was 21 days for 1 variety, 22 days for 7 varieties, 23 days for 26 varieties, 24 days for 9 varieties, and 25 days for 1 variety of short-staple cotton. Sea Island cotton required 27 days. The average duration of the square period for the varieties grown at Florence, S. C., in 1925 was 26 days, or 3 days longer than the average for these varieties.

Flea hopper parasites.---The parasitization of cotton flea hopper eggs, as determined by H. J. Crawford, of Port Lavaca, Tex., from over 10,000 eggs collected in Texas in June and July, ranged from 3 to 76 percent, averaging 27 percent. Of the two species of parasites present, 25.5 percent were Erythmelus n. sp. and 1.5 percent Anaphes amonocerus Gir. No notable difference in parasitization was found in flea hopper eggs deposited in different host plants including three species of croton, two species of Solanum, cotton, and horsemint. Erythmelus sp. was also reared from eggs in bitterweed.

Cotton leaf worm.---Although the cotton leaf worm appeared in southern Texas on May 27, only 2 weeks later than in 1936, it has not increased in abundance nor spread as rapidly as it did last year. K. P. Ewing reports that the infestation has been confined to a small acreage in Calhoun County and that comparatively few farmers have used poison. Practically no spraying with lead arsenate has been done as is usually the case, because, with a heavy boll weevil infestation also present, farmers have realized the advantages of dusting with calcium arsenate to control both insects. Worms were found in Alachua County, Fla., on July 6 and probably represent a

separate migration from that in Texas. During the latter part of July scattered light infestations were found in southern Georgia and Alabama, and during the first 10 days of August in the Delta section of Mississippi and Louisiana. In no section has the infestation been heavy this year and, as the crop is rapidly approaching maturity, it is expected that very little dusting will be necessary to protect the crop.

Cotton stainer in Puerto Rico.--A survey was conducted by L. C. Fife in June to determine the species of pyrrhorrhids and pentatomids staining Sea Island cotton on the southern coast of Puerto Rico. The percentage of injured bolls ranged from 6 to 30, averaging 17 percent; the percentage of injured locks ranged from 3 to 19, with an average of 9 percent. Dysdercus andreae L. was the most abundant species, but the following species were present and likely responsible for some of the "stainer" injury: Nezara viridula (L.), Podisus sagitta F., Piezodorus guildinii Westw., Thyanta perditor F., and Dysdercus neglectus Uhl.

Host plants of the pink bollworm.--Mature green seed capsules of Hibiscus trilobus and H. brasiliensis were collected by L. C. Fife from near infested cotton fields at Boqueron, P. R., to determine whether they were infested with pink bollworm. Of 87 pods of H. trilobus examined, 16 percent were found to be infested. Many pupae were found inside the pods, a few pods containing three live pupae each. The involucre completely covers the seed capsule, except for a small opening at the extreme tip, and some of the emerging moths were trapped in this enclosure and died. Of 446 seed pods of H. brasiliensis collected adjacent to heavily infested fields, none were infested.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Supervision of regulatory measures.--Additional Federal inspectors were temporarily assigned to the lower Rio Grande Valley district in Texas to assist in supervising the processing of the enormous cotton crop produced in that area. The Texas department of agriculture also placed additional men in this district. Sterilization plants were in readiness to handle the cottonseed produced in the valley. Additional oil mill and compression facilities were also built. At the close of July 61,680 bales had been ginned in the four counties included in this district. With the exception of a few days when there was some congestion, the facilities proved adequate to handle the heavy ginning. There are 84 gins, 2 compresses, 3 oil mills, and 8 central sterilization plants located in this quarantine area. State and Federal inspectors stationed in other pink bollworm quarantine districts have been engaged in supervising the installation of new facilities and in the remodeling of old plants.

Road-traffic inspection.--On July 5 a traffic-inspection station was opened on the principal highway leading out of the lower Rio Grande Valley. This station is operated on a 24-hour basis. During the remainder of July a total of 11,167 cars were inspected and 219 confiscations were made. The majority of the confiscations consisted of lots of seed cotton taken from cotton-picking sacks in the possession of cotton pickers moving out of the

regulated area. The most unusual interception consisted of a lot of 500 pounds ($1/3$ of a bale) of seed cotton which had been placed on the bottom of a truck to serve as a bed for a sick person. Fortunately, the person was not so ill but that it was possible for the truck to return to a point inside the area for disposition of this seed cotton. This station also acted as a clearing point and checking station to check up on permits issued to truckers for the movement of products out of the area under regulation. The only other traffic inspection consisted in road patrols maintained in the Panhandle of Texas and New Mexico. These patrols were to prevent the movement of uncertified products out of pink bollworm areas of western Texas and New Mexico.

Laboratory inspection.--The inspection of preserved bolls was continued at most of the stations in the regulated area in western Texas, New Mexico, and Arizona. These inspections were negative. The inspection of preserved bolls collected in areas not known to be infested with the pink bollworm was continued at the San Antonio laboratory, with negative results through July 15.

Gin-trash inspection.--Gin-trash inspection was inaugurated in the lower Rio Grande Valley of Texas during the first week of July. At the close of July, 10 pink bollworm larvae had been found in trash originating at 3 different gins in Cameron County, in the area already under quarantine. Gin-trash inspections were begun in Matamoros, Tamaulipas, Mexico, about July 10, and by the close of the month 338 pink bollworms had been found in trash from the 8 gins located in Matamoros. Gin-trash inspection in the counties adjacent to the lower Rio Grande Valley, but outside of the quarantine area, were negative through July. At the close of July a total of 10 inspection units were engaged in gin-trash inspection work in southern Texas in the area lying between San Antonio and the Mexican border. An inspection unit consists of a trained inspector, two assistants, a gin-trash machine mounted on a ten-truck chassis, and a light delivery truck used in bringing trash to the machine.

Wild cotton eradication program in Florida.--There were no crews in the field during July. The status of the work was such that it was possible to temporarily discontinue the removal of wild cotton plants during the summer months. A total of 22,300 preserved wild cotton bolls was inspected, and specimens of the pink bollworm were found in bolls collected at Cape Sable and on Key Largo. These wild cotton areas, which continue to show pink bollworm infestation, are, fortunately, the farthest removed from domestic cotton plantings of northern Florida, Alabama, and Georgia. No pink bollworms have been found in wild cotton bolls in any county north of Collier County, Fla., in the last 3 years.

Thurberia plant eradication in Arizona.--The drought in the Santa Catalina Mountains of southern Arizona continued throughout the month. The lack of water in the canyons made it impossible to set up a camp. Consequently, the destruction of Thurberia plants was carried on by crews operating

out of the city of Tucson. The crews are continuing the recleaning of the Tortollita Range. Remarkably few plants are being found that were missed at the time of the original clean-up of this mountain range. A number of seedling plants are being removed, which indicates that the recleaning is well worth while. The number of workers assigned from W. P. A. rolls to this project was reduced to 114, effective July 15.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Dust mixtures containing rotenone effective against pea weevil.--

Dust mixtures containing rotenone have given excellent control of the pea weevil in recent large-scale field tests in Idaho, Washington, and Oregon, according to reports submitted by T. A. Brindley, J. C. Chamberlin, and their associates. In the Hillsboro section of Oregon a total of 60 fields, involving approximately 300 acres of peas grown for canning, were included in the tests. Most of this acreage was treated with a dust mixture containing 0.75 percent rotenone, with talc as a diluent, but certain of the fields were treated with dust mixtures containing 0.25, 0.50, and 0.75 percent rotenone, respectively, with diatomaceous earth as a diluent, while three fields were left untreated as checks. Two applications of these dust mixtures were made to all the fields. The first dust was applied as soon as possible after the field came into extensive bloom, and prior to pod formation, whereas the second application was made in a period ranging from 7 to 14 days after the first. An examination of peas at the viner indicated that the percentage of control in the treated fields averaged approximately 97.7 percent. In general, it appeared that the dust mixture containing 0.75 percent rotenone with talc as a diluent gave superior results to any of the dust mixtures containing diatomaceous earth as a diluent, although it was not possible to apply as heavy a dosage of the dust mixture containing diatomaceous earth as was the case where talc was used. In the Dayton, Wash., area many tons of rotenone dust mixtures have been applied to the weevil-infested pea fields. In most instances a dust mixture containing 1 percent rotenone has been applied to strips 20 to 30 feet wide around the edges of the field, where the hibernating weevils have congregated. Under favorable weather conditions, most of the infestations in the treated fields have been reduced more than 95 percent and in some instances the weevil population has been reduced 99 percent. From one to three applications to these field borders have been necessary, depending on the movement of the weevils into the fields after such fields have been dusted.

Effectiveness of cuprous cyanide and natural cryolite against tomato pinworm.--Results of field plot tests performed by J. C. Elmore, of the Alhambra, Calif., laboratory, indicated that a cuprous cyanide dust mixture with talc as the diluent (1-5), cuprous cyanide used as a spray at the rate of 3 pounds to 100 gallons of water, and natural cryolite diluted with talc and diatomaceous earth (5-4-1) have considerable promise as insecticides for the control of the tomato pinworm. Treatments with these materials resulted in control ranging from 67 to 80 percent. Phenothiazine spray containing 3 pounds of this material to 100 gallons of water, plus a wetter and spreader,

gave 44 percent control. Negative or poor results were obtained with sprays containing an organic thiocyanate, cryolite, calcium arsenate, nicotine sulphate, and a light oil-pyrethrum extract combination, as well as with dust mixtures containing pyrethrum, calcium arsenate, and phenothiazine.

Economic status of cabbage worms on cabbage.---A summary of data obtained by C. E. Smith, W. J. Reid, Jr., and their associates at the Baton Rouge, La., and Charleston, S. C., laboratories, representing an analysis of field studies performed in the fall of 1935 and the spring of 1936, indicated that on an average 41 percent of the 4,000 cabbage plants under observation failed to make marketable heads (U. S. Grade No. 1), because of cabbage worm injury; that an additional 23 percent failed to mature owing to causes other than cabbage worm injury; and that the remaining 36 percent of the plants produced marketable cabbage. The data from these field studies also demonstrated that under the conditions existing during the two seasons when these observations were made the average damage per worm caused by the cabbage looper, the imported cabbage worm, and the larvae of the diamond-back moth was found to be represented approximately by the relative numbers 86, 76, and 19, respectively, whereas the total damage caused by these three species was represented approximately by the relative numbers 39, 33, and 24.

Beet leafhoppers migrate from southern Arizona to Utah and Colorado.---Studies by O. A. Hills and M. F. Bowen, of the Grand Junction, Colo., laboratory, during the spring of 1937 corroborated previous conclusions that southern Arizona is the source of the major population of beet leafhoppers, which migrate into the agricultural areas of eastern Utah and western Colorado. Field studies this spring demonstrated that the populations of overwintered leafhoppers in the Utah-Colorado areas were so low that these areas could not be of any importance in contributing to the populations in beet fields. Data obtained this year show that three definite influxes of Eutettix tenellus Bak. came into the western Colorado beet-growing districts. These influxes occurred on April 20, May 8 or 9, and May 18. First-brood development in the southeastern Utah breeding areas was too late to have contributed materially to the influxes into western Colorado. Most of the nymphal population in these areas developed subsequent to the migration from southern Arizona and as late as May 17 a large percentage of the first-brood nymphs were still in the first three instars.

Plowing may aid in control of lima bean pod borer.---The results of field experiments by Rodney Cecil, of the Ventura, Calif., laboratory, indicate that the clean plowing under of the overwintering larvae of the lima bean pod borer to a depth of approximately 6 inches in the soil may aid greatly in the control of this pest. In these experiments 100 mature Etiella zinckenella Treit. larvae in their cocoons were buried in soil of two different types at depths of 1, 2, 3, 4, 5, and 6 inches. In general, the percentage of normal adults emerging from the buried larvae ranged from approximately 50 at the 1-inch depth to 2 percent for the individuals buried 6 inches deep. The number of deformed adults reaching the soil surface showed a similar trend, with respect to depth of burial. No significant

differences could be detected between the percentage of adult emergence in the Yolo Fine Sand and the Yolo Sandy Loam used in the experiments. These soils represent the principal types on which lima beans are grown in the Ventura district.

Status of phenothiazine as an insecticide for celery leaf-tier and imported cabbage worm.--C. B. Wisecup, of the Sanford, Fla., laboratory, reports that laboratory insecticide tests using quarter-grown and nearly mature larvae of the celery leaf-tier (Phlyctaenia rubigalis Guen.) and quarter-grown larvae of the imported cabbage worm for the comparisons of the toxicity of 5 dilutions each of phenothiazine, calcium arsenate, and synthetic cryolite, ranging from undiluted to 1-25, with sulphur as a diluent, indicated that there was no significant difference between the mortality from calcium arsenate and synthetic cryolite for the celery leaf-tier, although the stronger concentrations of cryolite had a tendency to give the best kill. Phenothiazine was definitely inferior to calcium arsenate and synthetic cryolite against the celery leaf-tier and its further use in control studies with this species was not indicated. With the imported cabbage worm, calcium arsenate gave a significantly greater mortality than did either phenothiazine or synthetic cryolite, but phenothiazine showed promise, as the three stronger concentrations were not inferior to the best material used, and its further study in a control program for this insect is definitely indicated.

INSECTS AFFECTING MAN AND ANIMALS

Ants an important factor in control of screwworms.--In a study made by A. W. Lindquist, at the Uvalde, Tex., laboratory, of the effects of ants in destroying larvae of Cochliomyia americana Cushing and Patton, in nature, it has been found that of over 5,000 larvae of C. americana present in the carcasses of animals, only 32, or 0.6 percent, emerged as flies. In every test various species of ants were noted to be attacking the larvae and carrying them away. Where the checked carcasses and larvae were protected from the attacks of ants the emergence was 93 percent.

Screwworm larvae unable to withstand hot, dry summer.--Mr. Lindquist also reports the following results of tests to determine the fate of C. americana larvae when dropped under natural conditions: "A series of observations on cloudless days showed that when the temperature on the ground surface reached 116° to 120° F. there was a complete kill of C. americana within 30 seconds and before they could burrow into the ground. Above 120° they succumbed in rather protected places, i. e., grass, weeds, and light debris. Above 130° the sun killed the larvae instantly. In deep shade in sloughs there was apparently no sun kill. It is estimated that on cloudless days with a maximum air temperature (weather shelter) of 96°, from 5 to 8 hours of the day are not hot enough for effective sun kill of larvae in open, dry, unshaded or partly shaded environments. Some evidence is at hand of sun kill of pupae in open areas when the larvae dropped at night and during the cooler parts of the day."

Effect of temperature and humidity on furniture carpet beetle.--

Wallace Colman, of the Beltsville laboratory, working on the biology of Anthrenus vorax Waterh., reports that the most interesting results so far obtained have been that when fully grown larvae from summer room temperatures are introduced into a constant temperature of 15° C. (59° F.), and a relative humidity of 75 percent, pupation may be initiated, but no case has yet been recorded of its successful completion. When pupae are introduced, adults may develop, depending apparently on the stage of development of the pupae when introduced. When adults were introduced there was no oviposition.

Horn fly injury to cattle.--Observations on the ability of horn flies to produce injury to cattle and the degree to which these insects may predispose animals to the attack of screwworm flies were made at the Dallas, Tex., laboratory by W. G. Bruce. In a period of 2 weeks it was found that from 1,800 to 4,000 flies were able to produce 21 sores on an animal, each of which was susceptible to screwworm attack.

New laboratory established in Massachusetts.--For the purpose of studying the biology, habits, and methods of control of the American dog tick (Dermacentor variabilis Say), vector of the eastern form of spotted fever, this Division has established a laboratory at Vineyard Haven, on Martha's Vineyard Island, Mass. C. N. Smith has been transferred from the Washington office to take charge of the work at the new laboratory.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Forty living larvae of the Mexican fruitfly were intercepted at El Paso, Tex., on April 24 in a white sapote fruit in baggage from Mexico. Living larvae and pupae of the olive fruitfly arrived at New York on January 4, 6, and 7 with olives in cargo from Italy. Living specimens of Hercinotrips pattersoni Bagn. were taken at Washington, D. C., on May 6 on Aloe grandidentata in the mail from South Africa. J. C. Crawford reports that this species was formerly placed in the genera Heliothrips and Hercotrips. Living adults of Bruchus luteicornis Ill. were found at Mobile, Ala., on March 31 in vetch mixed with rye-straw jackets for whiskey in cargo from Scotland. A cast skin of the pink bollworm was taken at New Orleans on February 24 in a cottonseed in passenger's baggage from Dutch Guiana. A living specimen of the cryptos-temmatid Ceratocombus areolatus McA. & M. was intercepted at Brownsville, Tex., on May 12 on lettuce in baggage from Mexico. A living larva of the chrysomelid Fsylliodes chrysoccephala L. arrived at Philadelphia on May 27 in a turnip in ship's stores from India. Living specimens of the thrips Frankliniella williamsi Hd. were taken at Hidalgo, Tex., on January 1 on sugarcane in baggage from Mexico. A living specimen of the membracid Aphetea inconspicua Fowl. was intercepted at San Francisco on May 13 on an orchid (Lycaste skinneri) in cargo from Guatemala. Living specimens of the coccids Aspidiotus zonatus Frauenf. and Targionia vitis Sign. were taken at Washington, D. C., on May 6 on truffle oak in the mail from France. Neither species is supposed to occur in the United States.

Bostrichid in derris roots.---Fifty-three larvae, 7 pupae, and 43 adults, all living, of Sinoxylon anale Lesne were intercepted at New York on May 25 in derris roots in cargo from the Philippines. This bostrichid has been found seriously attacking stored derris roots in Kyushu, Japan.

Fruitfly larvae in grapefruit.---Thirty-five living larvae of Anastrepha suspensa (Loew) were collected on April 27 in 27 grapefruit in the field at Arecibo, P. R. In addition to grapefruit, this trypetid has been collected in Puerto Rico in coco-plum (Chrysobalanus icaco), custard-apple (Anona reticulata), guava (Psidium guajava), kumquat (Fortunella margarita), orange, pomarrosa (Eugenia jambos), sour orange, star-apple (Chrysophyllum cainito), strawberry guava (Psidium cattleianum), India-almond (Terminalia catappa), and yellow mombin (Spondias mombin). It has also been intercepted in guava from Cuba, Dominican Republic, and Puerto Rico.

Pathological interceptions of interest.---Colletotrichum truncatum (Schw.) Andrus and Moore, which has been intercepted on lima beans a number of times (see News Letter for March 1935, p. 23), was found on green beans (Phaseolus vulgaris) from Trinidad on July 22 at Houston. Phragmidium disciflorum (Tode) J. F. James was intercepted on roses from continental Europe for the first time on April 12 at New York in 10 plants from Hungary, in baggage. Determinations have just been reported for diseases on some wild grass from Mexico intercepted on November 8, 1935, at Nogales. The host was determined as Chloris sp., the diseases as Phyllachora sp., Septoria sp., Puccinia chloridis Speg. (first interception), and P. versicolor Diet. & Holw. This latter interception precedes the one on Andropogon contortus, listed on page 27 of the July 1937 News Letter as being the first. Puccinia heterospora B. & C. was intercepted for the first time on April 11 on an undetermined malvaceous plant in baggage from Mexico. Teichospora sp. (no species reported on the host) was intercepted at New York on April 14 on Ruta graveolens from Italy. Uromyces striatus medicaginis (Pass.) Arth. was intercepted for the first time on July 8 at New York in alfalfa in cargo from Argentina. Vermicularia trichella Fr. was intercepted at New York on July 5 on English ivy in baggage from Scotland.

Citrus canker continues to arrive.---Citrus canker (Bacterium citri (Hasse) Doidge) was intercepted from time to time at various ports during the fiscal year 1937. The interceptions, totaling 23, included infected Citrus aurantifolia from Ceylon and C. grandis from Ceylon and Straits Settlements, in stores at Philadelphia; C. nobilis from Japan in stores and C. sinensis from China (4) and Japan, in baggage at Seattle; C. sinensis from Japan, in ships' quarters at San Francisco and Seattle; C. sinensis from Japan, in stores at Baltimore, New York (3), Philadelphia, and San Pedro (3); and Citrus sp. from Japan in stores at Baltimore and Philadelphia (2). These interceptions were made during 9 months of the year--July (2), August (1), December (2), January (4), February (2), March (4), April (1), May (4), and June (3).

Entomogenous fungi on intercepted insects.--During the fiscal year 1937 a number of diseased insect specimens were sent in with the plant disease specimens. Determinations included Aegerita webberi Faw. on Dialeurodes citrifolii (Morgan) on citrus leaf from Cuba; Beauveria bassiana (Bals.) Vuill. on a coleopterous adult in banana debris from Mexico; Cephalosporium lecanii Zimm. on Coccus viridis (Green) on gardenia (8) and sour lime from Cuba and orange from Bahamas; Metarrhizium anisopliae (Metsch.) Sor. on a roach in banana debris from Panama and on roaches (2 interceptions) and undetermined insect from Honduras or Panama in banana debris; Microcera sp. on scales on Citrus grandis from Cuba and Puerto Rico; Myriangium duriaei Mont. on Lepidosaphes beckii (Newm.) on oranges from Bahamas, Cuba (2), and Jamaica, on Parlatoria pergandii Comst. on orange from Brazil and on undetermined scales on Citrus grandis from Cuba and Java; Nectria diploa B. & C. on Chrysomphalus aonidum (Linn.) on lemon from Cuba, on Ischnaspis longirostris (Sign.) on coffee from Trinidad, on Lepidosaphes beckii (Newm.) on king orange from Cuba, on oranges from Bahamas (2), Cuba (6), and on lemon from Cuba and Panama; Ophinctria coccicola (E. & E.) Berl. and Vogl. on undetermined host on orange from Nicaragua; Pedonectria coccicola (E. & E.) Patch on L. beckii (Newm.) on orange from Mexico.

DOMESTIC PLANT QUARANTINES

White-fringed beetle project established.--An allotment for the control of the recent outbreak of the white-fringed beetle (Naupactus leucoloma Boh.) in areas in Alabama and Florida has been made available. R. N. Dopson is designated field leader, with headquarters in the George Building, Florala, Ala. Mr. Dopson will also continue in charge of the citrus canker eradication activities in the Southern States. Inspection to determine the distribution of the beetle is under way with a force of 46 Federal inspectors, 10 Alabama State inspectors, and 8 Florida State inspectors. A force of about 400 laborers is at work constructing barrier furrows and ditches. To August 7, approximately 10,000 acres has been found infested. Nearly 100,000 acres has been inspected, representing a complete coverage of the known infested area and that adjacent thereto. The main infested area extends immediately west and southwest of Florala and Lockhart, Ala., covering parts of three townships in the Counties of Covington, in Alabama, and Walton and Okaloosa, in Florida. There are 14 small isolated areas in the immediate vicinity of the larger infestation, all located in the three above-named counties, except one which was found in the southwestern part of Geneva County, Ala. A remote infestation was found in Walton County at Glendale, about 16 miles southeast of Florala. One light infestation was also found at Laurel Hill in Okaloosa County, approximately 10 miles southwest of Florala. The over-all area comprises 18 miles east and west and 14 miles north and south.

Control activities of the white-fringed beetle.--With the use of tractors, teams, and heavy plows, approximately 30 miles of highway ditches have been established to August 7 to form barriers against the spread of beetles from the infested areas. Heavy barrier ditches made with caterpillar tractors and specially devised plows have been placed around the entire area. In addition to these outer barriers, over 60 miles of furrows have been dug

around fields within the infested area to prevent spread to adjacent farms or woodlands. Post holes, 15 to 20 feet apart, are dug in the bottom of the furrows and ditches to serve as traps for beetles. Large quantities of live beetles, trapped in these ditches, have been washed down the streams, although it is not believed this type of dispersal represents a material additional hazard. Careful inspection has thus far resulted in finding no beetles at long distances from infested fields, although live beetles have been found clinging to shrubbery along the streams. Intensive inspection will be extended, it is contemplated, approximately 10 miles in every direction from the known infested area and along the principal highways for 25 to 50 miles. Hand-picking to destroy as many of the adults as possible was done in the towns of Floral and Lockhart.

Spread of white-fringed beetle.--The white-fringed beetles cannot fly. There are many ways, however, in addition to crawling, by which they can be distributed, including the transportation of farm and timber products and farm equipment, and because of their number and habits, these beetles may be carried intentionally or unintentionally by persons traveling through or from the infested area. Egg masses deposited in soil may be carried on people's shoes or on the hoofs of livestock. These insects are parthenogenetic; therefore a single insect carried to an area is capable of establishing an infestation. Quarantines have now been promulgated by the infested States and these restrictions are enforced by State and Federal inspectors.

Cooperation in control activities of white-fringed beetle.--County agents in the infested areas and in adjacent counties have cooperated fully and actively in inducing the growers to place ditches and furrows around their fields, even though the fields are not known to be infested, and in inspecting their premises for the insects. Specimens have been exhibited at country stores and other public places in order that farmers may become acquainted with the pest without visiting the infested fields. Specimens are also being distributed to county agents and inspectors of other States. Officers of infested counties have loaned tractors and heavy road equipment and trained operators and mechanics to further the work. The local C. C. C. camp has furnished a tractor for barrier construction. Farmers and local groups have organized to conduct a control campaign.

Sweetpotato weevil inspection.--With a force of 15 Federal men and 5 to 10 State men, a survey for the sweetpotato weevil is being conducted cooperatively with the States of Texas, Mississippi, Alabama, and Georgia, and 10 to 12 temporary men will also be placed on the work for seasonal survey. Four infestations were found in Mississippi outside the known infested area and three infestations in Texas. Present efforts are directed toward inspection of seed beds and of volunteers in the fields in which sweetpotatoes were grown last year. Inspection will then be made in the fields of early sweetpotatoes after harvest, when the weevils, if present, may be found on any exposed tubers left in the soil. It is contemplated that within the next few months the infested area may be determined to the extent that a tentative control or eradication area may be established and a definite program worked out. Quarantines are established by the States to prevent distribution of

the weevil to uninfested areas and it is contemplated that such quarantines will be amended to protect the control and eradication areas, when established, by preventing reinfestation through movement of host products from infested areas to eradication areas.

Nursery areas inspected for phony peach disease.--To the close of June, the environs of 547 nurseries in 11 States had been inspected for the phony peach disease, of which 106 were found exposed to the disease. All the infected trees found in the sanitation zones have been destroyed. More inspection remains to be done.

More States place standardized quarantines on peach diseases.--State quarantines relating to the phony peach disease, standardized according to the recommendations of the quarantine committee of the Southern Plant Board, have been adopted by Alabama, Georgia, Illinois, Louisiana, North Carolina, South Carolina, and Tennessee. Legal orders declaring the disease a public nuisance and requiring prompt removal of trees so infected, have been issued by Alabama, Georgia, Louisiana, Mississippi, Tennessee, and Texas. New Mexico has recently established a quarantine relating to peach mosaic disease in that State with standardized certification requirements as to a 5-mile disease-free zone around the infected areas in shipping host plants out of such areas, regardless of their destination.

Peach mosaic control activities.--To the close of June over 2,000,000 peach trees on 16,540 properties were inspected for peach mosaic disease in the infected States of California, Colorado, Texas, Arizona, New Mexico, and Utah, and 42,882 infected trees were found on 2,809 properties. Of this number of infected trees, 13,769 have thus far been removed. In Utah the disease has been reduced 85 percent since the 1936 inspection season; in Colorado 90 percent since 1935. In California no new infected counties were found. However, the percentage of diseased trees is running considerably higher this year than last, with light infections scattered in San Diego County, where approximately 400 acres of peaches are planted in the mountainous area. In Texas and Arizona several more counties have been found infected since last year. In New Mexico the percentage of diseased trees is running higher than in 1936, owing to a more thorough and systematic inspection having been made. Removal of the diseased trees throughout the infected areas will be vigorously pursued throughout the remainder of the year.

Citrus canker activities.--Citrus canker was found in July on one property at Talleau, Assumption Parish, La., and all Citrus trifoliata trees on the site were promptly destroyed. The canker eradication project was continued on a reduced basis in July with house-to-house inspection made in the 5-mile zones surrounding areas in which the disease has formerly been located. Abandoned Satsuma groves in West Florida are being eradicated by a corps of approximately 100 relief laborers.

Produce cars inspected in transit for Japanese beetles.--Owing to the arrival of the season when Japanese beetles are in flight, transit inspectors at Chicago, St. Louis, Kansas City, Cincinnati, and Omaha are inspecting all

refrigerator carlots of fruits and vegetables from the areas heavily infested with the beetles, and many of the ventilated box carlots. In July, 24 live beetles were found at Chicago in 14 cars, 6 at Cincinnati in 5 cars of potatoes, and 1 at Kansas City. A State inspector is assisting in the work at St. Louis and railway agencies in the various cities are co-operating in full in giving notice of car arrivals. Many empty cars from the infested area, showing evidence of not having been cleaned at origin, as required by quarantine regulations, have been reported for corrective action. From Cincinnati report comes that carloads of beans are now coming through free from various kinds of insects which were found in such produce in the 1936 inspection season. One live Japanese beetle was also found at a New York transfer in a small shipment of celery plants.

Omaha transit inspections increased by coordinating agencies.---A report of transit inspection activities in Omaha and Council Bluffs for the last fiscal year states that the 22-percent increase in number of violations intercepted during the year can be attributed to the assistance of additional Bureau inspectors from the barberry eradication project and of Nebraska State inspectors.

Nurserymen fined for disregarding blister rust control areas.---An Iowa nursery company was prosecuted and fined \$130 on October 21, 1936, for having made 13 shipments of Ribes to points in States having legally established blister rust control areas, without having obtained the required permits which are issued in the event such plants are not consigned to the control areas. These shipments, which were intercepted at various times over a period of several weeks, were turned back by transit inspectors at Omaha, Council Bluffs, Chicago, St. Paul, and Buffalo.

Black stem rust quarantine revised.---A revision of the black stem rust quarantine, effective September 1, 1937, adds the States of Missouri, Pennsylvania, Virginia, and West Virginia to the list of States designated as protected in notice of quarantine no. 38, as revised effective August 1, 1931. Under the recent revision, the interstate movement of all barberry and Mahonia plants, except the Japanese barberry (Berberis thunbergii) and its rust-resistant varieties, into or between the States of Missouri, Pennsylvania, Virginia, and West Virginia, as well as into or between the States of Colorado, Illinois, Indiana, Iowa, Minnesota, Michigan, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming, which were previously designated as protected States, is restricted. Permits must be obtained before shipping the immune species (other than Japanese barberry) to the protected States.

CONTROL INVESTIGATIONS

Nicotine fumigation effective against silkworm larva.---In experiments conducted at Beltsville, Md., by H. H. Richardson, assisted by A. H. Casanges, nicotine fumigation has been found very effective against the one species of lepidopterous larva so far tested, namely, the silkworm larva (Bombyx mori L.). This larva was found to be about as susceptible to nicotine gas as some of the common aphids. Furthermore, the very large fifth- and sixth- instar

which weigh 1 or more grams each, were apparently just as susceptible under the conditions of the test as were the second-instar larvae, which are about 1/30 the weight of those of the fifth and sixth instars. Although relative humidity has previously been found to be a very important factor in the efficiency of nicotine fumigation, dry conditions rendering it much more effective, the relative humidity conditions present after fumigation was completed did not appear to be of importance. Mortality of fumigated aphids and thrips (1/2-hour fumigation) was just as high when they were kept dry after fumigation as when kept damp.

Methyl bromide as a fumigant.--The work on methyl bromide as a fumigant for fresh fruits and vegetables to destroy the adult Japanese beetle has been continued by A. C. Johnson and J. W. Bulger, in cooperation with the Divisions of Fruit Insect Investigations and Japanese Beetle Control. In small lots of beans, 8 to 25 bushels, no injury to the beans was detected with dosages up to 2 pounds of methyl bromide per 1,000 cubic feet, giving complete mortality of all beetles contained in the package. No difficulty was encountered in killing all the beetles placed in commercial packages of tomatoes nor in the fumigation of white potatoes with this compound.

INSECTICIDE INVESTIGATIONS

Relationship of grains of spray residue per pound of apple to micrograms per square centimeter of surface.--Mr. H. W. Rusk, of the Vincennes, Ind., laboratory has recently published a conversion table from which grains per pound of arsenical residue may be read as micrograms per square centimeter, knowing the size of the apples as indicated by the number of fruits per pound. It is believed that this table will be useful to those having to do with arsenical spray residue deposits.

Particle size of commercial calcium arsenates.--L. D. Goodhue, of the Beltsville, Md., laboratory, has studied the particle size distribution in 22 commercial calcium arsenates using the sedimentation apparatus described by him and C. M. Smith (Indus. Engin. Chem., Anal. Ed., vol. 8, pp. 469-472. Nov. 1936). The particle size of the various samples differs greatly. Mr. Goodhue's study indicates that there is a correlation between chemical composition and particle size, as well as between density and particle size. Also, the amount of soluble arsenic varies with particle size. The finest materials have the least soluble arsenic. There is no correlation of particle size with bulking value (cubic inches per pound).

Chemical composition of commercial calcium arsenates.--O. A. Nelson and C. C. Cassil, of the Washington, D. C., laboratory, have recently published the results of a chemical examination of all commercial calcium arsenates. These samples were the same as those examined by Mr. Goodhue for particle size. So-called special grades of calcium arsenate were found to be finer and more basic and to yield less soluble arsenic than the regular products of the same manufacturer. It was found that the molar ratios of $\text{CaO}/\text{As}_2\text{O}_5$ varies from brand to brand and also in the same brand from year to year.

New rapid micromethod for nicotine developed.--Mr. Goodhue, in his study of the rate of evolution of nicotine from insecticidal dusts containing it, has developed a turbidimetric micromethod for the determination of small quantities of nicotine. The nicotine to be determined is run into a solution of silicotungstic acid containing some formic acid and the point of maximum turbidity determined from the readings of a photoelectric cell that receives light through the titration cell. Quantities of nicotine from 70 to 600 micrograms can be determined easily and rapidly, with an accuracy of about 5 micrograms.

Derris residues on cabbage.--C. C. Cassil has recently demonstrated that the red-color test for micro amounts of rotenone previously developed in this Division can be applied to the study of derris or cube residues on cabbage. Chlorophyll and wax from the outside leaves complicated the recovery of the rotenone, but the procedure finally developed overcame the difficulty. It was found that cabbages from a plot that had received a total of 94 pounds of derris dust (9.4 pounds of derris) in six applications, retained (5 days after the last dusting) 0.006 grain derris per pound. Five-sixths of this was on the four outer leaves, which normally are discarded before the cabbage is sold to the retail trade.

BEE CULTURE

Conference on bee-breeding.--A conference devoted entirely to bee-breeding, the first of its kind in the New World, was held in Washington, D. C., on July 14-15. It marked the first occasion when both trained beekeepers and geneticists have met together to discuss various phases of bee-breeding. Those attending the meeting were: L. M. Bertholf, Western Maryland College; L. J. Cole and Harry Laidlaw, University of Wisconsin; E. J. McNay, Kansas State College; F. B. Meacham, North Carolina State College; L. R. Watson, Guggenheim Fellow, Alfred University; P. W. Whiting, University of Pennsylvania; and W. V. Lambert, Bureau of Animal Industry, U. S. D. A. Besides J. I. Hambleton, others present from the Division of Bee Culture were C. E. Burnside, Otto Mackensen, and W. J. Nolan. Lee A. Strong, chief of the Bureau, gave a brief welcome on the opening day and A. S. Hoyt and S. A. Rohwer, assistant chiefs, spent a short time with the conferees on the succeeding day. During the conference the general aspects of the bee-breeding problem were set forth, not only from the standpoint of what has already been accomplished with the bee itself but also with other hymenopterous insects. A resume by P. W. Whiting of what has been accomplished with Habrobracon juglandis Ashm. by himself and associates was of great interest in this connection. The subject of matings, both natural and artificial, was reviewed, as well as what characters could best be utilized in breeding. The discussion of characters included those already available and also the possibility of using induced mutations. Other topics covered were rearing and maintaining stock; procuring and using samples; making measurements and records; and the roles that the Department of Agriculture, other institutions, and various individuals can play in working together on a general bee-breeding program. The following is a summary

of important points emphasized in the conference: (1) Fundamental work on the genetics of the honeybee should be given equal priority with those phases of breeding having to do with race improvement through the selection and inbreeding or crossing of existing strains and races of the honeybee on the basis of some colony character such as honey production. This fundamental work can most easily be conducted by a study of some readily recognized mutant character expressed in the individual bee, for example, a mutant eye color. (2) A more detailed study is needed on the process of reproduction in the honeybee, especially as regards the reactions of both queen and drone in mating under natural conditions. (3) An up-to-date summary and interpretation of cytological literature dealing with the honeybee is needed. (4) A new cytological study by a cytologist experienced in technique with hymenoptera and in the use of latest cytological methods is essential. (5) An attack should be pushed on the problem of improving the technique of both the Watson and Laidlaw methods so that a higher degree of certainty will accompany work with these methods, both as to percentage of queens from which worker progeny can be obtained and as to percentage of success in filling the spermathecae of individual queens with sperm. (6) Artificial insemination can now be used to maintain a reserve reservoir of choice stock and to make crosses in genetic studies involving characters affecting only the individual bee. Natural matings must still be resorted to in breeding for colony characters because mass production of progeny per queen is needed in these cases. (7) Certain distinctive racial characters are available for immediate use in inheritance studies and bee-improvement work. These include not only body characters expressed in the individual bee but colony characters as well. A few mutations of such a nature as to be of great value in genetic work are likewise available. (8) The use of X-rays is the best method at present for inducing mutations. (9) Every care should be used to preserve and propagate mutant stock.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Another European weevil in North America.--Specimens of a weevil damaging white birch leaves in the Chequamegon National Forest, Wis., and submitted by L. W. Orr, of the Division of Forest Insect Investigations, have been identified by L. L. Buchanan as Orchestes alni L. Most of the specimens are referable to the variety or subspecies pubescens Stevens and represent the first North American record for this form. Another variety or subspecies of alni (scutellaris F., of which testaceus Mull. is a synonym) has been present in this country for a good many years. Of the many named forms of alni most are now treated as either mere color phases or synonyms, but alni pubescens and alni scutellaris are considered to represent distinct varieties or subspecies, and by some writers even distinct species. Statements in European literature indicate that alni scutellaris is found chiefly on alder and alni pubescens chiefly on birch.

A lepidopteron damaging corks of liquor bottles.--Two moths, in poor condition, intercepted by the Division of Foreign Plant Quarantines in a case of liquor from England, have been identified by August Busck as Oinophila v-flava Haworth, of the family Oinophilidae. This is an interesting microlepidopteron of African origin introduced long ago into Europe, where

its larva has been observed to feed on a fungus growing in old wine cellars. Sometimes the corks of the wine bottles are attacked, causing leakage and sometimes appreciable loss of wine in storage. So far as known, this is the first record of the interception of this species at an American port.

New distribution record for a species of sandfly.---Among a few sandflies collected by Margaret Foster at Cataumet, Mass., and submitted for determination by the Division of Insects Affecting Man and Animals, were six specimens which have been identified by Alan Stone as Culicoides dovei Hall. These represent a decided northward extension of the range of a species hitherto not known from north of South Carolina.

Rearing record for an uncommon bethylid parasite.---Three specimens of a small hymenopterous parasite belonging to the family Bethyridae, identified by C. F. W. Muesebeck as Plastanoxus chittendenii (Ashm.), were recently reared by W. H. Anderson, of the Division of Fruit Insect Investigations, from a coleopterous larva. The latter has been determined by A. G. Boving as a species of the genus Cis, probably Cis fusciceps Mellie. The parasite specimens consisted of two females and a male, the females being the first individuals of this sex to be recorded.

Notes on certain specialized roaches.---During the past year several roaches of unusual interest have been intercepted in plant materials, mainly orchids, from Colombia and Venezuela, and have been identified by A. B. Gurney. In that region several genera occur composed of species the males of which are winged, but whose females never bear functional wings and are extremely heavily sclerotized and otherwise adapted for boring in stumps and logs, or about the leaf sheaths of plants. Of the roaches associated with orchids, a fauna is being sampled that apparently is often overlooked by collectors. Poroblatta caudelli Gurney was recently described from such material. P. pluto Rehn, described in 1930, and several species which appear to be previously unknown have also been intercepted. The only roach of such a nature found in the United States is Cryptocercus punctulatus Scudder. Both sexes are entirely wingless and colonies live in decaying logs in the Appalachian Mountains and in Washington and Oregon. It is hardly possible that the tropical species could become established here.

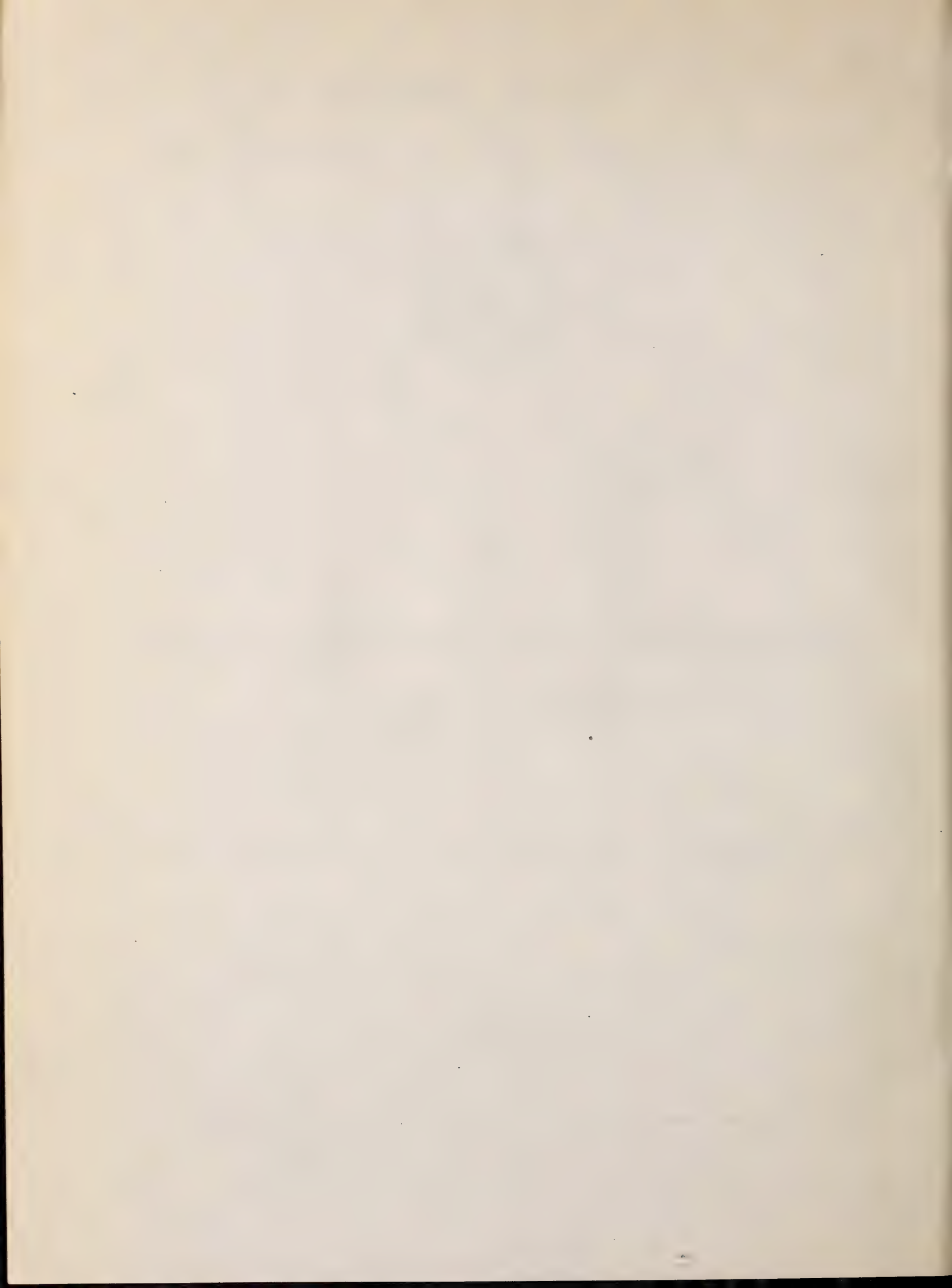
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DEPARTMENT OF AGRICULTURE



BUREAU OF
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NEWS LETTER

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NEWS LETTER

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October 1, 1937

FRANCIS EVERETT BAKER

Francis Everett Baker, assistant entomologist of the Division of Fruit Insect Investigations, stationed at Moorestown, N. J., died on September 15, 1937, following several months of serious illness. Mr. Baker was born at Baldwinsville, Mass., on July 1, 1903. He was graduated from the Massachusetts Agricultural College in 1926. That year Mr. Baker reported for work on the Japanese beetle investigations, upon which he was engaged up to the time of his death. His field of investigation included the use of soil insecticides for the control of the larvae of the Japanese beetle, and other methods of destroying the immature stages of this beetle in soil.

RESEARCH ASSISTANT TO THE CHIEF OF THE BUREAU OF ENTOMOLOGY
AND PLANT QUARANTINE APPOINTED

On September 7 P. N. Annand was appointed Special Research Assistant to the Chief of the Bureau, and C. M. Packard was appointed to succeed Mr. Annand as Chief of the Division of Cereal and Forage Insect Investigations. Mr. Annand will devote his time to unifying the Bureau's research and making it more effective. This research covers a very wide and constantly growing field. Divided among twelve subject matter divisions, it deals with insects and their relation to man, animals, and crops. Effective control measures for insect pests must be based on exact information on the way the insect looks and lives and on its relations to its hosts. This calls for knowledge of the hosts and their habits and extends into chemistry as it pertains to the developing of insecticides. Central planning is essential in getting the most out of this research.

FRUIT INSECT INVESTIGATIONS

Headquarters established at Eugene, Oreg., for work on filbert insects.---Field headquarters for the work on filbert insects in the Pacific Northwest have been established at Eugene, Oreg., with S. M. Dohanian in charge. The address is P. O. Box 346.

Springfield, Mass., substation discontinued.--It became necessary to close the Japanese beetle substation at Springfield, Mass., at the end of August. I. M. Hawley, who has been in charge of this substation, has returned to duty at the Moorestown station.

Japanese beetles feed on fruit of grapevines.--Heretofore no feeding by Japanese beetles on the fruit of grapes has been observed. On August 13, however, extensive feeding by beetles on bunches of grapes at Holmdel, N. J., was observed by C. H. Hadley and W. E. Fleming, of the Moorestown, N. J., station. The variety most heavily attacked was Portland, then just about ready for picking. The beetles ate holes in the skin, commencing at the top of a bunch and sometimes attacking most of the berries on the bunch. Some feeding was also observed on the variety Ontario, but this variety appeared much less susceptible than Portland. The owner of the vineyard stated that he had also observed some feeding last year on Jersey Muscat, a variety which ripens in early September. Foliage feeding was observed in considerable abundance throughout the vineyard, the varieties most heavily attacked being in the following order of susceptibility: (1) Delaware, (2) Brighton and Salem, and (3) Fredonia and Niagara. Part of the vineyard had been sprayed with the standard derris-rosin residue emulsion combination, two and three applications having been made after the beetles commenced feeding on the fruit of the Portland variety. While the spray appeared to be effective in keeping beetles off the foliage, it did not protect the fruit. However, when several rows were sprayed with the same material at double strength (6-6-100), most of the beetles were driven off the fruit, except where the bunches were so thoroughly protected by the leaves that the spray did not reach them. It was noted that honeybees were also very abundant and feeding on the grapes. They did not seem to break the skin of the grapes but fed only on those fruits the skin of which had already been broken by beetles. It was also noted that the derris-rosin residue spray had apparently very little repellent effect on the bees. Fifteen to 30 minutes after the spray had been applied, while practically all of the beetles had been dispersed by the spray, except from those bunches which were well protected by leaves, the bees seemed to be present in fully as large numbers as before the spray was applied and were apparently unaffected by it.

Laboratory testing of insecticides for the Japanese beetle.--At the Moorestown laboratory W. E. Fleming has completed the season's tests with various materials as stomach poisons and repellents against the Japanese beetle. During the season 1,540 cage tests were made, involving a total of 308,000 beetles. Fifty-eight materials of the E series, prepared by the Division of Insecticide Investigations, and 15 other materials were tested.

Recovery of *Tiphia popillivora* (Koiwai strain) colonies.--J. L. King, L. B. Parker, and M. H. Brunson, of the Moorestown station, have recently completed scouting of 125 colonies of *Tiphia popillivora* (Koiwai strain), an imported parasite of the Japanese beetle, which were liberated in the generally infested area in 1934. The parasite was recovered at 70 of these

colonies, representing a 56-percent colony recovery. As the colonies are only 3 years old, no effort was made to determine the relative abundance of the parasite at the different colony points.

MEXICAN FRUIT FLY CONTROL

No Mexican fruit flies collected in Texas.--Traps failed to take any Anastrepha ludens Loew, either in Texas or in Matamoros and Reynosa, although other fruit flies were trapped in Texas as follows: A. serpentina Wied., 74; A. acidusa Walk., 1; A. pallens Coq., 181. The results obtained from trapping and fruit inspection are shown in the following table:

Species	Texas	Mexico
<u>Adults trapped</u>		
<u>A. serpentina</u> -----	74	1
Premises-----	54	1
<u>A. acidusa</u> -----	1	0
Premises-----	1	0
<u>P. pallens</u> -----	181	4
Premises-----	73	2
Total-----	256	5
<u>Larvae collected</u>		
<u>A. ludens</u> -----	0	*191
<u>A. acidusa</u> -----	0	*1
Total-----		192

*From market fruit.

Large Texas citrus fruit crop in prospect.--Unusually hot and dry weather in the Rio Grande Valley during August retarded the development of citrus fruits to some extent. Many growers have had to irrigate at a time when irrigation is usually not necessary. In spite of this dry weather, the fruit is holding well and indications point to another season of heavy production.

CEREAL AND FORAGE INSECT INVESTIGATIONS

Classified American wheats show wide range of resistance and susceptibility to hessian fly in California.--W. B. Cartwright, of the Sacramento, Calif., laboratory, reports that the classified American wheats are offering unlimited opportunities for studies on inheritance of resistance to the hessian fly in California, reacting as they do through a range of high resistance to high susceptibility. The present studies are limited to those varieties with low plant infestations and low populations, although significant differences are recognized in average fly populations between varieties

having high plant infestations. A high degree of resistance is recorded in the field tests of 1937 in the varieties Baldrock, Berkeley Rock, Dawson, Honor, Nabob, Red Clawson, and Wheedling; consistently low infestations in Prohibition, Leap, Harvest Queen, Prosperity, Marquillo, Penquite, Oregon Zimmerman, Dixon, Genessee Giant, Mediterranean, Kawvale, Farward, and Java; and an intermediate degree of infestation in some varieties of the Blackhull group and other Crimean wheats. The variety Sol is conspicuously susceptible. In 1937 it was 100 percent infested in unit plant samples and sustained a population exceeding 75 flaxseeds per plant. In comparison, other susceptible varieties, as Squarehead Master, sustained 40 flaxseeds, Red Russian 30, Wilhelmina 15, and many others lower. Fifty-four varieties, or approximately 25 percent, of the common classified wheats had plant infestations below 80 percent, although this series of varieties decreases in number with more critical field testing in the special fly nurseries. The tests of 1936-37 indicate that resistance is limited neither to early or late wheats nor to winter or spring types for fly resistance, and a selected few of these have been chosen for the study of inheritance of resistance, the behavior of genotypes, and their reactions with varying or successive plant growths.

Hessian fly resistance of Dawson wheat bred through three backcrosses to susceptible varieties Poso and Big Club.--Mr. Cartwright also reports that in the field tests of 1937, involving 483 hybrid families, there are positive indications that the resistance of Dawson wheat has been successfully transmitted to the third backcross to susceptible Poso and Big Club. There is no indication that this resistance, in its accumulated two-factor condition, has been weakened by the three successive backcrosses. Single-factor lines derived from the crosses have segregated in regular order, and several have resistance approaching that of Dawson.

Changes of reactionary system of some wheat varieties to hessian fly, made by varying seeding dates in California.--Mr. Cartwright reports that a fall seeding and a spring seeding were made of 100 wheat varieties for the spring 1937 tests on hessian fly. Several resistant varieties, as Dawson, Prohibition, Prosperity, Baldrock, Red Clawson, Nabob, Wisconsin 18.4, T. N. 1006, and Berkeley Rock, remained unchanged in their reactions to the fly; while several varieties showed, significantly, differences in plant infestations for the two seedings. As a whole, the spring seeding was more heavily infested than the fall seeding, as evidenced in some examples given in the following table.

Variety	Infestation	
	November seeded	March seeded
	Percent	Percent
Lofthouse-----	50	93
Fulhio-----	18	90
Flint (Red May)-----	23	76
Huston-----	18	80
Michikof-----	67	90
Rural New Yorker, No. 6:-----	0	20
Illini Chief-----	0	20
Red Chief-----	44	100
Blackhull-----	33	58
Superhard-----	33	60
Ioturk-----	46	88
Kanred-----	33	60
Nebraska No. 60-----	75	93
Red Rock-----	0	50
Purdue No. 1-----	3	34

European corn borer infestation in potatoes.--A. M. Vance, of the Toledo, Ohio, laboratory, reports that a survey of infestation by the first-generation corn borer in Irish potatoes was conducted by N. J. Nerney during the last 2 weeks of July, on eastern Long Island, N. Y., in central Connecticut, and in west-central Massachusetts. A large part of the last two regions lie in the Connecticut River Valley. In each of the three regions, 25 fields of potatoes, taken at random, were examined according to tested survey methods. The data obtained are summarized by region in the following table. Similar surveys in potatoes were conducted on eastern Long Island in 1932, 1933, 1934, and 1935, and the average numbers of borers per 100 plants for these years were determined as 22.8, 64, 48.7, and 30.1, respectively. In 1937 the average number of borers per 100 plants in the same region was 60. Potatoes in central Connecticut and west-central Massachusetts have not been surveyed previously for corn borer infestation. In the former region the average number of borers per 100 plants in 1937 was 106.2, and in the latter, 73.5. Although the two fields with the highest borer populations (580 and 400 per 100 plants) were found in Massachusetts, there were practically twice as many fields with an average of over 100 borers per 100 plants in Connecticut as in either the Massachusetts or Long Island regions. Both on Long Island and in Connecticut 88 percent of the fields surveyed showed infestation by the corn borer as compared with 56 percent of the fields in Massachusetts. The maximum number of borers found in a single potato plant in 1937 was 12. The data are tabulated in the order of planting date but are too limited for any interpretation of differences in infestation due to this factor. Planting of potatoes was earlier on Long Island than in Connecticut and Massachusetts and the average size of the fields was much larger there than in the other two regions. Although the data on the two common varieties of potatoes, Irish Cobbler and Green Mountain, have been separated in the accompanying table, no real differences in their susceptibility to the corn borer can be shown because of the distribution of the fields in relation to the abundance

of the corn borer. It is apparent, however, on the basis of this survey, that both varieties were attacked by the first generation of the borer to about the same extent.

Summary of data on corn borer infestation in potatoes, Long Island, N. Y., Connecticut, and Massachusetts, 1937

Region	Period of survey	Number of Fields	Average		Average		Fields	
			plants infested	per 100 plants	borers per 100 plants	infested by borer	with average of over 100 borers per 100 plants	Fields
			Number	Percent	Number	Percent	Percent	
Eastern Long Island, N.Y.	July 17-21	25	30.3	60.0	38.0	24.0		
Central Connecticut	July 22-27	25	48.4	106.2	88.0	44.0		
West-central Massachusetts	July 27-31	25	23.5	73.5	56.0	20.0		

Midsummer pupation of the European corn borer near Toledo, Ohio, in 1937.-- Mr. Vance also reports that the first midsummer pupation in 1937 near Toledo, Ohio, was found in a field of early sweet corn on July 20. On this date a total of 10 pupae were dissected from the more mature plants in the field, representing a pupation of 3.3 percent among 329 individuals so observed. All of the pupae appeared to have been formed recently, and several of them had not darkened in color. Since no pupae were found in the same field on July 14, it is concluded that the earliest pupation in 1937 occurred during the third week of July, at about the same time as in 1936.

Generations of the European corn borer on the Eastern Shore of Virginia.--D. W. Jones, Onley, Va., reports the development of three definitely demarked generations of the corn borer on the Eastern Shore this year, the first generation being confined almost exclusively to potatoes, and subsequent development occurring on corn. Moth emergence from second-generation larvae developed rapidly after the middle of August, with third-generation eggs being deposited in great numbers by August 19, thus allowing ample time for completion of the third generation under the conditions of the Eastern Shore environment.

JAPANESE BEETLE CONTROL

Farm-products inspection past peak.--By the end of the month fumigation of refrigerator cars was no longer required at most inspection points in the regulated area. At Philadelphia, 576 refrigerator cars were pre-fumigated during August. Inspectors stationed at New York City fumigated a

total of 2,656 empty cars from July 6 to August 31. A general decline in shipments of farm products from the regulated zone was noted in all areas after the peak in July. Shipments of sweetpotatoes, however, centering at Pocomoke and Salisbury, Md., were increasing, inspectors certifying 151 cars and 2 truck loads during the month. Bulk shipments of watermelons were also increasing in the Maryland area. Bean machines stationed at Salisbury, Md., ran on an average of 135 hours each, at times running 10 to 12 hours at one stretch. Considering the hard usage to which the motors were subjected, their performance was very satisfactory. At Fredericksburg, Va., 95 live beetles were removed from 100,000 packages inspected during the month. In the same period, 85 live beetles were removed from produce inspected in the Washington area. In the Trenton, N. J., area, 16 cars of produce and 7 empty cars were fumigated with HCN during the month.

Seasonal scouting of establishments nearing completion.--Classified nurseries and greenhouses in the regulated zones were scouted from four to six times during the 1937 scouting season. Infestations discovered on six sand, soil, and manure establishments about Hagerstown, Md., indicate that shipments of such products will require close supervision. Rescouting of two classified establishments in the Richmond, Va., area, supposedly free of the pest, resulted in a find of six beetles at one. Fifteen commercial and noncommercial nurseries and greenhouses in the New England sector were found to have the pest present on or within 500 feet of their premises. In the Philadelphia, Pa., area, beetles were discovered on the premises of certified greenhouses in greater numbers than ever before. Several new infestations were found at nurseries in the southeastern and northern parts of the Philadelphia area. Infestations were building up rapidly in eastern Pennsylvania, particularly in orchards. The first shipment of evergreens for the season was reported from Mineola, N. Y., during the week of August 16. Many beetles are still to be found in this section.

Trucking of uncertified southern-grown produce discovered.--An inspector stationed at the public market in Rochester, N. Y., reported over 20 violations by truckers of the farm products quarantine. Farm products obtained in the regulated zone in Delaware, southern New Jersey, and Maryland, and trucked to nonregulated points in New York State, made up the bulk of the interceptions. Interceptions of uncertified produce in intrastate transit from regulated to nonregulated zones were reported by inspectors stationed at Syracuse and Elmira, N. Y. Preparations are now being made for the prosecution of the violators.

Intercepted load of manure held 48 hours for fumigation.--Interception of a truck loaded with over 13 tons of uncertified chicken manure obtained at Baltimore, Md., was reported by an inspector stationed at road-patrol station No. 20 on U. S. Route No. 1, south of Fredericksburg, Va. The entire load of manure was driven to the outskirts of Richmond and fumigated with carbon disulphide. After forty-eight hours, the truck was released, and proceeded to its destination, Beaufort, S. C.

Trapping activities drawing to a close.--With the lifting during the month of traps set in 111 communities in 10 northern and western States, there remained in operation traps set in 89 towns and cities in 11 States. Trapping was slightly extended during August by the setting of traps in 23 additional localities in 6 States.

Experimental activities in cooperation with the Division of Control Investigations.--Experiments with methyl bromide as a fumigant for carlots of green beans and potatoes were continued in cooperation with the Division of Control Investigations. Temperature trials to test the efficacy of HCN as a fumigant were conducted in the Jersey City railroad yards. Application of the fumigant in precooled cars was by the discoid method. Large quantities of beetles were collected for use in these experiments.

National Park Service plans treating program at Wakefield, Va.--Approximately 13 acres are to be treated with arsenate of lead in the Wakefield, Va., infested area. A conservative estimate of beetles caught at this point has been placed at 7,000. Information and suggestions have been forwarded by the Bureau to the National Park Service, which is undertaking the control work.

Dead beetles interfere with fishermen.--Large numbers of dead beetles washed ashore from the Delaware River, particularly below Chester, Pa., gave fishermen cause for complaint. They claimed that their catches were curtailed because the fish were surfeited with beetles.

Moth infestations heaviest in lumber shipments.--Increased gypsy moth infestation in the immediate vicinity of cutting crews made necessary piece-by-piece inspection of lumber shipments from Maine and New Hampshire. Throughout the 18 inspection districts, 63 egg clusters, 3 larvae, and 1 pupa were removed from 19 lumber shipments. Ten egg clusters, 3 larvae, and 1 pupa were removed from 6 shipments of logs, railroad ties, granite, and nursery stock. An inspector stationed at Westerly, R. I., collected 10,000 gypsy moth larvae for experimental work at the New Haven, Conn., laboratory.

English elm succumbs in spite of "guaranteed" treatment.--Reconfirmation of a 27-inch English elm in the Moravian Cemetery at Dongan, Staten Island, N. Y., has finally convinced the owners, the United Brethren Church, that the tree has Dutch elm disease, and has gained their consent to its removal. This is one of a large number of trees treated annually since 1935 on the cemetery grounds by a practical tree worker who makes use of an injection method which he guarantees will protect trees from, and cure trees of, Dutch elm and other tree diseases. Before the present confirmation, no diseased trees have been found on this property since the summer of 1934, and the absence of disease has been general throughout the immediate vicinity of the cemetery.

Present status of scouting in the major work area.--Scouting of the tri-State infected area and protective zone was approximately 86 percent complete in the first go-over by the end of the month. Over 50 percent of the same area has already been rescouted a second time, and a small fraction

of the diseased territory has been scouted a third time. Of the 7,463 square miles which comprised the major work area at the beginning of August, there yet remains to be scouted approximately 950 square miles in the first scheduled go-over, 3,300 in the second go-over, and 7,100 in the third go-over.

Scouting in Pennsylvania.--Autogiro scouting is supplementing regular scouting on foot in an area of 730 square miles comprising the protective zone in Pennsylvania. A strip of territory along the Delaware River in Pike, Monroe, Northampton, and Bucks Counties, ranging in width from several hundred feet to approximately 1 mile, is scheduled to be scouted by crews on foot. An autogiro has been assigned to cover the rougher terrain in the western section of the work area. One of the three scheduled scoutings in the area assigned to foot crews was completed before the end of the month.

Confirmations increasing for town in Westchester County, N. Y.--Six trees confirmed during the first week in August in North Castle, Westchester County, N. Y., raised the 1937 total of trees confirmed in this town to 23. Diseased trees discovered in the past 3 years in the same locality numbered five, two, and seven, respectively. Piles of elm wood in the vicinity of the diseased elms may be the cause for the marked increase.

Revised instructions issued to scouts.--During the last of the three scheduled scouting surveys of the Dutch elm diseased work area, scouts have been instructed to sample only such trees as evidenced wilting or flagging associated with wilting, except where special conditions obtain. In some areas these same instructions have been given to scouts working on the second survey.

First case of Dutch elm disease at Athens, Ohio.--Upon confirmation, the first diseased tree found in Athens, Ohio, which is within the bounds of the southern Ohio Scolytus multistriatus infestation, was removed by an eradication crew early in the month. Located on the bank of the Little Hocking River, within 500 feet of the Baltimore & Ohio Railroad switch yards, the tree showed discoloration in the last three growth rings. About half the crown had died in 1936.

Importance of supervision demonstrated.--Systematic checking of the Indianapolis, Ind., W. P. A. scouts showed that, when working alone, they missed over 50 percent of the trees that should have been sampled. Under the surveillance of the Bureau's trained men and one State supervisor, scouting by the same men was more than 90 percent thorough.

Beetle-infested elm wood to be investigated.--Small wood, taken from elm trees and used by a farmer in Hunterdon County, N. J., as siding for a corn crib, was discovered to be heavily infested with beetles. Investigation is under way to determine whether the wood originated in chemically treated trees or was delivered on a fuel agreement.

Pandora moth larvae killed by solar heat.--In the pandora moth (Coloradia pandora Blake) outbreak on the Arapaho National Forest in Colorado, Mr. Beal reports that a heavy mortality occurred among the mature larvae as a result of solar heat. The mature larvae go into the ground to pupate and seek out soft spots where they can easily bore into the ground. These spots are usually free from duff and more often situated in little openings where they are exposed to the sun rays. Here many of the larvae were killed by the sun before they were able to bore into the ground, or were killed when pushed out of the ground by other larvae. These sun-baked larvae are elliptical in shape, not more than 1/2-inch long and 3/8-inch wide, appearing as greasy little pellets. They were shrunk from larvae 3 inches long and 3/8 of an inch thick. Although the ground is covered with dead sun-baked larvae, it is filled with living pupae which succeeded in getting into the soil in the larval stage.

Variations in emergence of Black Hills beetle.--During biological studies on the Black Hills beetle (Dendroctonus ponderosae Hopk.) by the Fort Collins, Colo., field laboratory, a wide difference was found in the time of peak emergence in different localities at the same elevations. At an elevation of 8,000 feet in southeastern Wyoming peak emergence occurred from limber pine during the last week in July. At the same elevation in central Colorado (200 miles south) peak emergence occurred from ponderosa pine the third week in August, or 3 weeks later than in Wyoming. It is not known yet whether this significant variation is due to host difference or to some peculiar climatic or seasonal variation in the two areas.

Spruce budworm causes severe losses in jack pine on the Superior National Forest in Minnesota.--Jack pine stands on certain parts of the Lac Croix District of the Superior National Forest in Minnesota now show a high percentage of mortality as a result of an outbreak of the pine form of the spruce budworm in 1936. L. W. Orr, of the Milwaukee, Wis., laboratory, reports that a recent examination showed almost 100 percent loss of trees over 60 years of age, especially on poor sites. Almost every tree has been very heavily attacked by Monochamus, probably M. scutellatus. These borers have now rendered the dead trees practically worthless, except possibly for low-grade pulpwood. There has been relatively little attack by Ips bark beetles. The relative inaccessibility of the area has made salvage of the timber very difficult. Defoliation was less severe in younger stands, and sample plots are now being established in such stands to determine whether these weakened trees will recover or be attacked and killed by the tremendous population of Monochamus beetles which is expected in 1938. The losses resulting from this outbreak of the spruce budworm on jack pine have been much greater than have occurred in any of the other outbreak areas in the Lake States. It is believed that this is because of the poor site conditions and the extreme drought and heat which followed the defoliation in 1936.

Forest tent caterpillar causing mortality of trees in affected stands in Minnesota.--Mr. Orr also reports that most of the aspen and birch stands which have been defoliated by the forest tent caterpillar for two or more years now show considerable injury. In some areas very few trees have died but the tree crowns are thinning out as a result of the death of the smaller

twigs and branches. In other areas many of the trees are dead and many have broken over. Practically all of the dead trees were heavily infested by the bronze birch borer before they died and a larger proportion of the trees which still appear to be alive are now infested by this borer. It therefore appears that there will be an almost complete loss of the aspen and birch in at least some of the affected areas. In mixed hardwood stands the defoliation has killed a large proportion of the overmature maple and oak. The results of the present outbreak of this insect are proving to be much more serious than were expected when the outbreak started.

Outbreak of Neodiprion lecontei in the upper peninsula of Michigan.--

Lee E. Yeager, also of the Milwaukee, Wis., laboratory, reports a rather widespread outbreak of Leconte's sawfly in the eastern part of upper Michigan. Plantations and young natural reproduction of red and jack pine are affected. Trees up to 20 or 25 feet tall have been completely defoliated in some of the most heavily infested areas. Mr. Orr found this sawfly to be quite abundant in parts of upper Michigan in 1935 and 1936 and in lower Michigan in 1935. The extreme heat of the summer of 1936 resulted in almost complete mortality of the eggs and young larvae in lower Michigan in 1936, and Mr. Yeager has found only a very few larvae there this summer. However, there was less mortality in 1936 in upper Michigan and the insect seems to be increasing in abundance. Certain plantation areas were protected by spraying in 1936 and are being treated again this season.

White pine stands of northern Idaho being covered by Forest Insect Survey.--A 12-man crew is now engaged in making a survey of the white pine stands of the Coeur d'Alene, St. Joe, and Kaniksu National Forests for the purpose of determining the present status of the mountain pine beetle infestation. Mr. Evenden states that this survey was started on August 4 and is under the direct supervision of T. T. Terrell, of the Coeur d'Alene, Idaho, laboratory. This project will last until the early part of November, as the program will include the Weiser National Forest in southern Idaho, where a rather severe infestation of the western pine beetle in ponderosa pine exists.

Mountain pine beetle broods dependent upon intensity of attack.--W. D. Bedard, of the Coeur d'Alene, Idaho, laboratory, reports that the number of mountain pine beetle attacks per square foot of bark surface apparently has a decided effect upon the abundance of brood produced in western white pine trees. The following table shows some of the effects of intensity of attacks.

Average per square foot of bark								
Attacks : per square foot	Trees : ex- amined	Bark : surface	Brood : Number	Egg : gallery per attack	Bark de- stroyed by : other agents	Para- sites	Preda- tors	
Number	Number	Sq. ft.	Number	Inches	Sq. in.	Number	Number	
1-5----	48	8,310	5.7	22	19.5	5.9	2.2	
6-10---	58	10,308	8.5	13	13.7	4.9	2.3	
11-15--	23	5,475	9.4	10	9.3	2.9	3.3	
16 and over	4	724	7.3	6	10.9	2.6	0.5	

Maximum brood is produced with 11 to 15 attacks per square foot. A lesser number of attacks provides a reduced potential in spite of the large length of egg gallery per attack, and a greater number of attacks causes overcrowding with a consequent higher mortality to the developing larvae. The optimum number of attacks apparently allows for the proper spacing of eggs, thus insuring sufficient food for each larva. It is interesting to note that more bark is destroyed by other agents, and parasites are more abundant in lighter-attacked trees, thus tending to utilize bark and destroy mountain pine beetle brood. These data were taken from brood examinations on the Coeur d'Alene National Forest and are perhaps indicative of conditions in this particular infestation only.

Mountain pine beetle increasing in sugar pine areas.--G. R. Struble, of the Berkeley, Calif., laboratory, reports that in the Sierra Nevada region of California the mountain pine beetle has shown more of an aggressive tendency this year than any year since 1933. At Mariposa Grove, in Yosemite National Park, a total of over 50 large mature sugar pines was killed within the past year. Twenty-five of these were felled by C. C. C. labor and treated by the solar heat method during June, July, and August 1937. In addition, 27 more trees containing broods of the preceding overwintering generation were felled and treated by burning. The majority of these trees were over 60 inches in diameter, DBH. In the cut-over areas of the Sierra National Forest near Signal Peak a total of 70 sugar pines was found to have been killed during the past year on an area of 1,600 acres. These are seed trees and reserve left after cutting. These totaled a loss of 47,430 board feet, which is a heavy drain considering that the area was cut-over 10 years ago and the reserve was left mainly to insure restocking of the area. Mr. Struble attributes the outbreak to heavy wind-falls which occurred within the area during the winter of 1935-36 and served as a breeding ground for a large population of beetles. In addition to this factor there was found to be a relatively light population of the most important predator of the mountain pine beetle, Enoclerus sphegeus Lec.

Heavy flight of lodgepole pine needleminer in 1937.--Mr. Struble also states that every alternate year the lodgepole needleminer (Recurvaria milleri Busck) occurs in the adult stage and enters a brief period of flight. The last flight period occurred in 1935 and the moths were expected again in 1937. This season the flight started July 10 and subsided August 15, with

the peak occurring between July 25 and August 10. The heaviest centers of infestation are found within the Tuolumne watershed of the Yosemite National Park. In a recent survey made by the National Park Service two areas were found where the defoliation caused by the needleminer is being followed by the mountain pine beetle, with the result that large areas of lodgepole pine are being rapidly turned into dead forests.

Conditions necessary for oviposition of *Melanophila californica* Van Dyke discovered at Hackamore field base.--The possible importance of *Melanophila californica* as a factor tending to increase the susceptibility of ponderosa pine to bark beetle attack led in 1936 to an intensive program of biological studies to determine the seasonal and life history of this insect. It was not until 1937, however, that the conditions necessary to successful oviposition of this species were discovered. K. A. Salman and A. S. West, who have been conducting these studies, report: "Emergence of *M. californica* and *M. gentilis* Lec. adults was practically completed during August, and that from many of the bark samples was very low probably due to the effects of molds that developed in storage and to abnormally low temperatures during the winter months. Bark containing prepupal larvae and pupae now is being removed from cold storage and exposed to normal temperatures. It is hoped this material will yield adults that can be used in experiments long after normal emergence has been completed. The forcing of attacks on logs in the presence of green branches and needles for food has been successful for both species of flatheads. This is true for both field-collected and reared material. Field-collected adults have lived in the forcing cages since July 2 (38 days), which extends the known length of adult life considerably. Eggs have been secured in large numbers. The largest number recorded as laid by one individual at one time of oviposition was 30. Groups of several eggs are commonly laid at one time and in one place. An egg parasite which has caused considerable mortality in the rearing material may be an important natural factor in the field."

Entomological factors important in experimental logging project.--The Blacks Mountain Experimental Logging Project, which will be carried on for the next 10 years by the Forest Service and the Bureau of Entomology and Plant Quarantine to determine methods of logging and management for preventing bark beetle damage, was started in May 1937. J. W. Bongberg, who has been conducting the entomological surveys in this area of 10,000 acres, gives the following report of progress: "Work has been continued on the points to be considered in determining the susceptibility of green trees. A tentative classification is being developed. An additional 50 trees have been classified and analyzed on the Fruit Growers Sale Area with satisfactory results. All merchantable trees in the stand on four compartments in the southwest portion of the Blacks Mountain Experimental Forest have been marked according to their susceptibility. The Experiment Station staff now is marking them for values and determining which ones shall be removed when logging starts around the middle of August. In addition, one compartment has been marked on which all and only susceptible trees will be logged this season. One other compartment has been assigned the Bureau for

the same work but that will not be cut this season. The stands on the five compartments that are to remain untouched also have been classified."

Bark beetles on elms.--On July 29 W. D. Buchanan and R. T. Webber, of the Morristown, N. J., laboratory, made observations in Greenwich, Conn., at a point where an elm affected by the Dutch elm disease had previously been removed and where about two cords of elm wood from other trees were present in the yard of a dealer in firewood. They found that the larger logs had been or still were heavily infested with the bark beetles Scolytus multistriatus Marsham and Hylurgopinus rufipes (Eich.). Two elms which stood in the center of the woodpile had been severely injured by adults of S. multistriatus feeding in the twig crotches. The terminal shoots had been so badly girdled that the trees appeared to be dying when seen from a distance. Seven small branches were cut from the trees. Forty-five of the 90 twig crotches had open injuries in them and in addition 109 injuries occurred where small shoots had been cut off. Forty-nine living S. multistriatus adults were collected from crotches. Of these 28 were females and 21 were males. The fungus which causes the Dutch elm disease was isolated from two of the females and four of the males by the Morristown laboratory of the Division of Forest Pathology, U. S. Department of Agriculture.

Elm trees killed with copper salts.--R. R. Whitten, of the Morristown, N. J., laboratory, reports on tests having to do with the solubility of copper salts in elm trees. These were conducted in connection with experiments to determine how standing elm trees can be satisfactorily killed and rendered unsuitable for bark beetle attack. Six small living elm trees were cut off at the bases and the cut ends placed in containers of solution. Two of the containers held copper sulphate solution, two held copper chloride solution, and the remaining two held copper nitrate solution. After 24 hours the solutions had been absorbed by the trees and the foliage was entirely brown. Twenty-four hours later the trees were sampled by means of complete increment cores at 8-inch intervals for the entire length of the stem. The cores from each tree were numbered consecutively from the base upward. The outer one-half inch of the xylem from both ends of the cores was removed and cut into thin wafer sections and placed in test tubes. Samples bearing odd numbers received 20 cc of water and were placed in boiling water for 30 minutes. After standing for 12 hours they were tested for copper by the potassium iodide, sodium thiosulphate titration method. Samples bearing even numbers received the same treatment with the exception that 5 cc of glacial acetic acid was added to each sample as soon as it was removed from the water bath. In all cases the tests showed the presence of considerable copper in the samples to which glacial acetic acid was added, whereas only one of the other samples showed the presence of a small amount of copper. It is evident from these tests that when these copper salts are injected into living elm trees they become "fixed" or insoluble in hot water. Their distribution in an elm tree is, therefore, dependent on the activity of the tree while they are in solution and not on diffusion. It is also true that a rapid distribution is imperative since very small traces of copper slow up and eventually stop all activity in an elm tree.

Eastern spruce beetle control.--J. V. Schaffner, Jr., of the New Haven laboratory, reports on the seasonal development of Dendroctonus piceaperda Hopk. at Rochester, Vt., where a control project for this bark beetle is now under way on the Green Mountain National Forest: "During August all stages of D. piceaperda were noticed. Living adults and eggs from the overwintering brood were found as late as August 26. The first pupae of the 1937 brood were found very common in two trees on August 5. On August 9 one tree was noted which contained numerous pupae and a few freshly formed adults. August 26 a tree, 19 inches DBH, was cut down and examined. This tree had lost most of its foliage very recently due to the severe infestation. The examination disclosed infestation extended for 37 feet up the trunk, and the majority were fresh adults. Samples near base and at about 20 feet indicated an infestation of about 100 beetles per square foot. Experiments are being conducted to obtain data on the late summer and fall issuance of the brood and whether new attacks are made by this brood during the fall."

Parasites of European spruce sawfly liberated.--P. B. Dowden and P. A. Berry, of the New Haven, Conn., laboratory, report that the last half of August was spent in northern Maine liberating parasites of Diprion polytomum (Htg.) supplied by the Canadian parasite laboratory at Belleville, Ontario. The parasites were shipped directly to Mattawamkeag and Jackman, Maine. They were received in excellent condition and liberated as quickly as possible. Nearly a million parasites, most of them Microplectron fuscipennis Zett., have been liberated at nine points in northern Maine. Sample collections of from 300 to 1,000 D. Polytomum cocoons were made at each liberation point, and recovery collections of 1,000 cocoons were made at Portage, Masardis, and Presque Isle, Maine, where M. fuscipennis was liberated in 1936. M. fuscipennis has already issued from cocoons collected at Masardis and Presque Isle, showing the establishment of this parasite at these two points.

Matsucoccus survey in Pennsylvania.--Thaddeus J. Parr, of the New Haven, Conn., laboratory, reports on a brief survey of Matsucoccus-infested pine in Pennsylvania. At Snyder'sville damage continues to be extensive, some trees being dead, others dying, and others showing the first extensive killing of terminal growth this year. Scotch pine growing with branches interlaced with heavily infested pitch pine showed no infestation. Several hitherto unknown infestations were found around State College. A heavy infestation was inspected at Paradise Furnace C. C. C. Camp, 17-1/2 miles from Macleton. Here, in a mixed plantation, the pitch pine are dying, and light infestations were found on table mountain pine, thought to be a new host record. At Mont Alto there is very severe damage to pitch pine in plantations, where extensive killing of current growth is showing on the larger trees for the first time this year. Shortleaf pine reproduction is also being rather severely damaged. It is thought that study plots should be located at some of these areas in Pennsylvania.

GYPSY AND BROWN-TAIL MOTH CONTROL

Sprout removal work correlated over entire infested area.---An employee of this activity has recently been designated to contact the field force engaged in gypsy moth sprout removal work. He spent the first week in August in the Pennsylvania area, inspecting the work of the crews and suggesting alterations in procedure designed to correlate the methods with those used in other sections. He is now visiting the sprout removal crews in the New England States.

Preparation of bait for assembling cage work completed.---The work of preparing the attractant material for gypsy moth assembling cages, to be used in the field during the summer of 1938, was completed on August 7. A total of 7,129 charges was obtained, which greatly exceeds the number prepared last year.

Moths recovered at assembling cages in New York.---Of 2,142 assembling cages set out in selected areas in New York State, 4 cages recovered 5 male gypsy moths. The recoveries were made in Southeast, Carmel, and Kent, all in Putnam County and within the limits of the barrier zone. The territory in the vicinity of the recovery cages will be scouted intensively to discover the infestations where the moths originated. No recoveries were made at the 984 cages set out in Pennsylvania nor at the 95 cages in New Jersey.

Shortage of eligible workers in Vermont and Connecticut.---A heavy crop of apples is expected this year in Vermont. Many orchardists have offered temporary employment in harvesting their crops to workers on this project, and very little gypsy moth field work will be accomplished in the fruit sections of the State during September and the first part of October. It will not be possible to scout with relief labor some of the territory in both States, where work is most needed, unless employment conditions change in the near future.

Deer and cattle aid sprout removal work.---Selective thinning work, which consists of cutting out trees and shrubs favorable for the development of the gypsy moth, is often done in heavily infested areas and in other selected locations. It is necessary to return to such areas in following years to remove sprouts which spring up from the stumps, in order to obtain full benefit from the thinning work. The sprout removal work will be unnecessary this season over a considerable area in Pennsylvania, as deer are so numerous and food so scarce in the region of Penn Forest and Buck Townships that the animals have fed upon the sprouts which developed in areas where the favorable food plants had been selectively thinned. A similar situation exists in several sections of Vermont, where the sprouts have been eaten by cattle in overstocked pastures in areas where the growth of the grass was retarded by lack of sufficient rainfall during the past 2 months.

Two infestations in northern Vermont apparently eliminated.---Intensive clean-up measures have been applied at the site of a gypsy moth infestation in the town of Derby, Vt., which is on the border of the Province of Quebec;

and at another infestation in Essex, Vt., about 35 miles south of the border. Burlap bands applied to trunks at both infestations during June revealed no caterpillars, which indicates that both infestations have been eradicated.

Sawdust machine in use in the field.--The sawdust machine, used to dispose of brush cut during thinning work, is now in operation at the site of an infestation in Cummington, Mass. This machine reduces to sawdust brush which could not otherwise be disposed of during periods when it would be unsafe to do burning work, and eliminates the necessity of returning crews to such locations later in the year when the slash could be safely burned.

Fencing material inspected outside of quarantined area.--Dead chestnut trees have been cut in the vicinity of Warren, Conn., to be used by the Connecticut State Highway Department in the construction of fences along highways in the northeastern corner of the State. While Warren is not under quarantine, the trees are being cut near areas where small gypsy moth infestations have been found in previous years, and the lumber has been carefully inspected before movement from the lots.

Progress of work in New York.--Gypsy moth work continues at the sites of several isolated infestations, and also at other selected locations, in New York State. During the first part of August W. P. A. workers assigned to duty in Shawangunk, Ulster County, and in Putnam Valley, Putnam County, were engaged in thinning operations and in removing the loose bark from some of the large trees so that scouting can be done more easily and efficiently. The small force employed in Dutchess County is engaged in scouting in the region of the infestation discovered last year in Amenia Township; and another small force employed in Albany is scouting in the northwest corner of the town of Guilderland. No infestation has been found in the latter town.

Several isolated infestations in Pennsylvania apparently eliminated.--No gypsy moth larvae, pupae, or moths had been located up to the end of August at the sites of infestations discovered during the fiscal year 1937 in the townships of Ransom and Carbondale in Lackawanna County, or in Tunkhannock, Chestnut Hill, and Coolbaugh in Monroe County. It would appear, from the results already obtained, that these isolated infestations have been exterminated.

Artillery material inspected for the gypsy moth on Army Reservation.--A junk dealer in Carbondale Township, Pa., was recently awarded the contract to salvage shell-casings and shell-heads for junk purposes at the Army Reservation in Tobyhanna Township, where the National Guard and the Regular Army have been trained during the past 15 or more years. The weight of shell-casings and shell-heads used in artillery practice during this period is estimated to be 30 million pounds. Any of the material lying on top of the ground will have to be inspected before movement from the reservation to Carbondale is permitted, as four infestations have been found within the reservation.

Increase in C. C. C. gypsy moth employees.--The number of C. C. C. enrollees employed on gypsy moth work increased from an average of 705 during the week ended August 7 to 806 during the week ended August 21. During the first part of the month most of the men were employed in patrolling burlap bands and crushing gypsy moth caterpillars and pupae, in creosoting egg clusters and female moths, and in removing the burlap from areas where no gypsy moths were found. Later in the month the men removed the burlap from infested areas and were then employed in selective thinning work and in burning forest slash and debris.

C. C. C. gypsy moth field meeting.--A circular letter pertaining to the C. C. C. gypsy moth field meeting to be held on September 2 at the Westfield, Mass., C. C. C. Camp has been sent to the proper State officials with a request that they be forwarded to the gypsy moth foremen, superintendents, and any other officials who might be interested. The State officials in charge of gypsy moth work in Vermont, Massachusetts, Connecticut, and New York have also been invited to attend this meeting. Past work will be inspected and future work described and discussed.

Brown-tail moth summary.--From July 1, 1936, to June 30, 1937, Federal W. P. A. brown-tail moth crews cut and destroyed nearly 3,045,800 winter webs, nearly one-half of the total in New Hampshire; over 779,000 in Massachusetts, and 743,000 in Maine; nominal numbers in Rhode Island and Vermont; and none were found in Connecticut. Over 48,800 miles of roadsides were scouted--more than 15,000 in Maine and 12,000 in Massachusetts; nearly 13,000 in New Hampshire; and much smaller mileages in Vermont, Connecticut, and Rhode Island. More than 24,500,000 trees were examined--over 6,000,000 each in Maine, New Hampshire, and Vermont; 5,000,000 in Massachusetts; and under 400,000 in Connecticut and Rhode Island. Nearly 265,000 trees were cut, principally in New Hampshire, Maine, and Massachusetts. None were cut in Rhode Island or Connecticut. Browntail W. P. A. work was suspended on June 30, 1937.

PLANT DISEASE CONTROL

Blister rust found on Ribes in Trinity County, Calif.--On August 13 blister rust infections on Ribes nevadense and R. cereum were located in Trinity County, Calif., in Township 29 North, Range 11 West. On August 19 two additional Ribes infections were found in this same township, also on R. nevadense, but several miles distant from the first infections. The distribution of infection on Ribes in this general locality strongly indicates the presence of infected pines nearby. This discovery of blister rust in Trinity County extends the known distribution of blister rust approximately 100 miles southward and places the present center some 117 miles south of the Oregon boundary, well within the sugar pine type of the coastal region of California. It is significant to note that one of the Ribes infections was found on a dry, rocky east-facing slope, subject to climatic and temperature conditions similar to those prevailing in the drier sections of the central Sierra region.

Blister rust infection on Pinus albicaulis on Mt. Hood.--Messrs. Martin and Benedict, of this Bureau, and Mr. Kummel, of the Forest Service, examined blister rust infection conditions on western white pine and on the white bark pine, Pinus albicaulis, in the Mt. Hood region of Oregon on July 9. Infection was general on western white pine at the lower elevations. P. albicaulis, which occurs at timber line on Mt. Hood at an elevation of about 6,500 feet, was found infected with blister rust and the cankers had just reached the fruiting stage. While a few of the blisters had broken and were disseminating spores, most of them were intact on July 9. It appeared from the condition of the cankers that the dispersion of aeciospores would take place throughout the month of July. On the other hand, the cankers on the infected western white pine at the lower elevations had dispersed all of their aeciospores prior to their examination on July 9. The fact that aeciospores were being produced so late in the season on P. albicaulis at the higher elevations showed that aeciospores in the Mt. Hood region would be dispersed from May until about the first of August, a much longer period than usual. The lateness of aeciospores production on P. albicaulis probably is due to the high elevation at which this species grows and the consequent backwardness of the season. Ribes bracteosum was observed along the stream beds on the lower slopes, and it was very heavily infected with the uredinal stage of the rust.

Control work started on Crater Lake National Park.--The National Park Service, in cooperation with the Bureau, is starting control work at Crater Lake, Oreg., to protect the Pinus albicaulis, which are of esthetic and scenic value around the rim of the lake. The principal Ribes is R. erythrocarpum, a trailing species that occurs in association with the pine. It usually requires some shade, occurring under the pines, and generally not in the open to any great extent. The work will be performed by labor assigned from C. C. C. camps on the National Park and will be under the technical direction of Mr. Wessela, who has charge of blister rust control work in Oregon. This year it is planned to work an area of about 1,200 acres to test the methods and practicability of removing the R. erythrocarpum under the field conditions found in the vicinity of the lake.

Ribes show little regeneration in Acadia National Park.--When control work was started at Acadia National Park, provision was made to conduct the activities so that definite information would be obtained on the cost and effectiveness of establishing and maintaining blister rust control under such mountainous conditions. A complete summarization of the data has not been made, but the following comparison of the results of initial and reeradication work in four of the control units indicates that the initial control work was very efficient.

Comparison of results of initial and reeradication work

Block:	Year worked	Acreage:	Number	:Feet of :	live stem:	Ribes per
no. :	:	of :	Ribes pulled :	of Ribes:	acre	
:	Initial:Reerad.:	block :	Initial:Reerad.:	pulled on:	Initial:Reerad.:	
:	:	:	:	reerad.:	:	
I	: 1930 : 1935 :	202	:15,347 :	450 :	740 :	76.0 : 2.2
V	: 1930 : 1936 :	631	:26,524 :	728 :	1,800 :	42.0 : 1.2
VI	: 1931 : 1936 :	668	:31,131 :	3,891 :	689 :	46.6 : 5.8
VIII	: 1931 : 1936 :	748	:25,151 :	2,251 :	1,126 :	33.6 : 3.0
Total-:	- : - :	2,249	:98,153 :	7,320 :	4,355 :	43.6 : 3.3

All of the initial control work in these four units was performed with regular labor, employed on cooperative funds, while the reeradication work was done by C. C. C. crews. Due to the differences in wage rates, no comparison has been made of the per-acre costs. An average of 43.6 Ribes bushes per acre were destroyed in these four units on the initial work. Only 3.3 bushes per acre were found when the areas were reexamined after a lapse of 5 to 6 years, and these Ribes averaged only about 7 inches of live stem per bush.

Salt treatment of barberry bushes in West Virginia proving effective.---Barberry eradication in West Virginia during the past summer has included a resurvey of certain areas covered in 1935 and 1936 to determine how much kill had resulted from previous work and to destroy any missed bushes, sprouts, and seedlings observed. The results have been most encouraging as to the effectiveness of salt for permanent barberry eradication. For example, a resurvey of two farms in Greenbrier County showed 94 new and sprouting bushes this season, whereas on the original survey 67,915 bushes and 1,075 seedlings were eradicated. The district leader also reports that all farms checked so far in Monroe County show a very high percentage of kill, many showing 100 percent. During the week ending August 4, 442 acres were covered on a resurvey and only 13 bushes found and destroyed, while on the original survey during the same week 200 acres were covered and 107,275 barberries killed.

Severe damage results from stem rust in certain parts of Indiana during 1937.---During 1937, Indiana farmers experienced the first serious epidemic of black stem rust caused by spores blown into the State from the South. Heretofore this source of rust spores has not been of commercial importance. The early source of stem rust spores has, in the past, been from the leaves of the common barberry, and whenever shriveling of the grain resulted from stem rust, it has been possible to find the common barberry bushes responsible for the early infection. Stem rust was first observed in Indiana this year near Lebanon, on June 7. Wheat in the extreme southwestern part of the State was in the late dough stage, and in the vicinity of Lafayette it was in the milk stage at that time. Field observations indicate that the rust blew into the southwestern part of the State earlier or in greater quantities than in the northern and eastern parts of

the State. It is believed that there was a secondary spread of rust from the southwestern part of the State into the northern and eastern parts. The final result of stem rust in Indiana was quite variable. Most of the wheat in the southern third of the State matured before the rust caused serious damage. Yields were high and the quality good in this section of the State. Occasionally a field of very late wheat was found in this section which was damaged by the rust. Fields which were seeded very late after removing a crop of soybeans showed the heaviest damage. For the State as a whole, the most severe damage occurred in the west-central counties. On June 1 the Department of Agricultural Statistics at the Purdue University Agricultural Experiment Station forecasted a yield of 17.5 bushels per acre and a total production of 37,835,000 bushels of wheat for Indiana. This was before the rust made its appearance in the State. On July 1 the forecast was for a yield of 17 bushels per acre and a total production of 36,754,000 bushels. This was when the rust first appeared serious. On August 1 it was estimated that the yield per acre was 16 bushels and the total production was 34,592,000 bushels for the State. This was after most of the wheat had been harvested. The report on August 1 states, "The quality of grain is comparatively poor due to black rust infection. An area about four counties wide along the Wabash River from Vigo to Wabash Counties was worst affected." From the above figures it would appear that the yield had been cut from 10 to 15 percent for the State as a whole.

State Department of Agriculture in Pennsylvania takes active part in barberry eradication.--The Pennsylvania State Department of Agriculture approved the appointment of William O. Keim, effective August 1, 1937. Mr. Keim had been employed as an agent by the Bureau since August 20, 1935. He acted as assistant State leader since May 1, 1936. He has been assigned full time to barberry eradication to perform the duties required of an assistant State leader. The State Department has also allotted some funds, in addition to the salary and travel expenses for their representative, to be expended on the project for chemicals and miscellaneous supplies as the project may require. Farmers within the areas where barberry bushes have been destroyed are well pleased with the results of the control work. There was no stem rust damage to grain within the control areas in the State during the years 1936 and 1937. Numerous letters have been received from farmers who have benefited by these results. The farmers, in their letters and in personal contact with field representatives of the project, have quite generally expressed the fact that it was impossible to raise a respectable crop of wheat or oats before the barberry bushes were destroyed because of stem rust damage, but they have had exceptionally good grain crops with no rust damage since the bushes were destroyed. Local epidemics of stem rust occurred throughout the northern half of the State this year wherever barberry bushes were present.

Line marking and strip surveys.--In covering wooded, brushy, and open areas for the destruction of either currant and gooseberry plants, or barberry plants, various methods are used for keeping track of the strips worked by the crews. In the case of blister rust control the two methods which have been found adapted to the greatest varieties of conditions are either scattering waste paper or using string lines. The breaking of twigs of brush and

other methods have also been employed. A report has just been received from the State barberry eradication leader of Ohio stating that in woodlands there, the use of a special line marker employing finely pulverized white lime has been found especially economical and adaptable. Rubber bags are made of heavy automobile inner tubes which have been cut into convenient lengths, one end vulcanized and the other end clamped to a wooden cross bar and handle. Several small holes are made through the tube so that lime may escape when given a tap against trunks of trees, fence posts, rocks, poles, bare clay banks, or other objects. Cloth bags made from sugar or salt sacks are also used with wire handles for carrying. Each end man carries a marker, an arrangement which reduces the tendency to stop each time the line shifts at the end of a strip. The marks can be seen for several days unless there are heavy rains, and are therefore useful for the supervisor in locating the crew and checking the area covered, as well as in aiding the crew in carrying out the work systematically. Recently, similar line markers made from canvas, with fine mesh screen about 3 inches square in one side, have been tried in two or three States and found fairly suitable for the purpose. The canvas bags are less expensive than the markers made from rubber tubing.

1937 rust data being analyzed.---In his report of September 3, E. C. Stakman, in charge of rust surveys, states: Work now is under way to summarize the course of development of the rust epidemic of 1937, and to evaluate the factors contributing to its development. Data have been accumulated on which final loss estimates can be based. It is evident that the epidemic of 1937 was one of the most unusual on record. The source of the epidemic seems to be different, the area covered was different from what it has been for many years, and in the spring wheat region there was greater variation in rust development and damage done than for many years past. The principal reasons for this unusual variation in damage are date of sowing, local rainfall and temperature, and differences in varietal resistance. Despite very heavy rust infection, durum wheats and Ceres yielded well in some localities. One very notable feature of the epidemic is the fact that the damage to oats and rye was negligible except in the immediate vicinity of barberries. The progress so far made in barberry eradication saved the oats and rye over extensive areas this year, as weather conditions during the spring were very favorable for infection of barberries and dissemination of rust from them. By the end of August, identification of 390 uredial collections, comprising 505 isolates and 13 different races of Puccinia graminis tritici, has been completed. At the same time, 36 aecial collections, comprising 54 isolates and 14 races, have been identified. About 450 additional uredial collections and 16 aecial collections are now in process of identification. So far, race 56, which was so prevalent in 1935 and 1936, constitutes 47 percent of all of the isolates, and the percentage is still higher in certain regions. The prevalence of race 56 undoubtedly explains why Ceres was again so susceptible to rust in 1937, as it was in 1935. The relative paucity of race 36 probably explains in part at least why Thatcher withstood rust so well this year. This variety was rusted to an appreciable extent only in a few localities where it had been planted late. Furthermore, the races that attack durums heavily were not particularly numerous early in the season, and this undoubtedly accounts partly for the fact that durum wheats in general

were not so heavily rusted early in the season as the bread wheats, and in many regions they never did become so heavily infected, although because of late maturity of durum there was opportunity for some of the races that attack them to multiply and eventually cause heavy rust."

COTTON INSECT INVESTIGATIONS

Chlorochroa ligata (Say) reared on cotton.--T. P. Cassidy and T. C. Barber report that at Mesa, Ariz., adults of the "Conchuela", Chlorochroa ligata, collected in alfalfa fields, deposited eggs on cotton in cages and by the end of August some of the nymphs were in the third or fourth instars. The adults of this species have been observed in small numbers on cotton in Arizona for several years, and if numerous would cause as much damage to cotton as the more abundant Euschistus impictiventris Stal and Chlorochroa sayi Stal. As collection records for several years show that no nymphs and comparatively few adults of this species have been taken on cotton, it is evident that under Arizona conditions it does not naturally breed on cotton.

Insecticide tests against cotton flea hoppers.--K. P. Ewing and R. L. McGarr, Port Lavaca, Tex., report concerning toxicity tests in which 10 insecticides or mixtures were used against the cotton flea hopper, Psallus seriatus Reut. These tests were commenced on July 24 and were completed on August 7. An average of 265 adults and 213 nymphs were used with each insecticide. In all of these cage tests 2,645 adults and 2,126 nymphs were used. The insecticides used and the average percent mortality obtained in the cage tests were as follows: 10 percent paris green-90 percent sulphur, 87.7; 7.5 percent paris green-92.5 percent sulphur, 76.7; 20 percent cryolite-80 percent sulphur, 67.9; 20 percent calcium arsenate-80 percent sulphur, 62.4; sulphur, 60.0; 33.33 percent calcium arsenate-66.67 percent sulphur, 59.4; 50 percent calcium arsenate-50 percent sulphur, 56.5; fuller's earth-white arsenic (97-3 mix?), 46.9; calcium arsenate, 34.7; and 97 percent lime-3 percent white arsenic, 16.2. These insecticides or mixtures were also used under field conditions in Latin-square tests, 1-acre field plot tests, and in large-scale dusting experiments, but the results have not yet been obtained.

Parasites of the cotton flea hopper (Psallus seriatus Reut.).--K. P. Ewing and H. J. Crawford, Port Lavaca, Tex., report that the percentage of parasitization of cotton flea hopper eggs by Erythmelus n. sp. (Mymaridae) in 13 collections of Croton sp., cotton, Solanum elaeagnifolium, and S. rostratum was 29.1 percent. Parasitization on cotton was 36 percent. The highest parasitization was 55.5 percent, on Croton monanthogymus. A possible reason for a higher parasitization on this plant is that the bark is comparatively thin with a tough stem. This causes the eggs to be placed near the surface. The pubescence on this plant is shorter than on C. caritatus. Anaphes anomocerus (Mymaridae) did not emerge from these 13 collections but emerged from bitterweed. Two Erythmelus n. sp. were reared on clean plants that were caged with flea hoppers for oviposition. These parasites spent 10 to 12 days in the egg of the cotton flea hopper. The flea hopper eggs were 1 to 3 days old at the time of oviposition by the parasites. Erythmelus n. sp. were observed to copulate

soon after they emerged. Orius sp. (Anthocoridae) were observed feeding on Eyrthmelus n. sp. in the vials of the emergence cages.

Insecticide tests for hemipterous insects in Arizona.--T. P. Cassidy and T. C. Barber report the results of the insecticide tests at Mesa, Ariz., in which a Latin square of 36 plots was used. On August 11 a second series of form counts on 900 plants was made by counting all the fruiting forms on 25 plants in each of the 36 plots. The extremes in the plots varied from an average of 28.33 to 31.23 forms per plant. This small range of forms per plant indicates the uniformity of the plots and also the light insect infestation. This light infestation was also shown by population counts made on July 16, August 13-14, and August 26. These counts were made by making 50 strokes with a standard net in each plot, or 1,800 strokes in the 36 plots. In the first series of counts made on July 16, 389 specimens of hemipterous insects were taken, in the second series the number dropped to 198 specimens, and in the third series only 187 were collected. The lightness of the infestation is also emphasized by the fact that most of the hemipterous insects collected were Geocoris spp. (271, 157, and 122 respectively in the 3 series) which are mainly predaceous. On August 24 the percentage of bolls punctured in the various plots was superficially determined by examining 25 bolls in each plot. Of these 900 bolls, only 97, or 10.8 percent, were punctured by insects. The extremes ranged from an average of 8 percent punctured bolls in the six plots dusted with paris green 5 percent-sulphur 95 percent, to 16 percent punctured bolls in the untreated check plots. In a second series of experiments at Mesa in which four large plots were used, observations made during July and August indicate that conditions were almost identical with those in the Latin-square plots. In these plots the average number of forms per plant on 400 plants examined on August 12 was 29.9, as compared with an average of 30.07 forms on the plants in the Latin square. The insect collections in the two series of plots were almost identical. In this test on August 23, 400 bolls (100 from each plot) were examined both externally and internally. The calcium-arsenate treated plot had 5 percent punctured bolls, the sulphur treated plot had 9 percent punctured bolls, while the two untreated check plots had 9 percent and 13 percent punctured bolls. These records indicate that control from the use of calcium arsenate was noticeable even though the insect infestation was very light. In a third series of experiments conducted at Buckeye, Ariz., nine field plots of approximately 3 acres each were used. Six were dusted at 7-day intervals with different insecticides, using a five-row power duster for making the applications. The cotton on these 27 acres averaged more forms per plant than in the two fields at Mesa, and the hemipterous insects were also more abundant. On August 4-7 all forms were counted on 300 plants in each of the 9 plots. On the 2,700 plants there was an average of 35.47 forms. In the 6 plots treated with insecticides the average was 37.26 forms per plant, while the average of the 3 untreated check plots was 31.9 forms. The leading plot, dusted with calcium arsenate 20 percent-sulphur 80 percent, had an average of 48.11 forms per plant; the calcium arsenate plot was second with 42.83 forms per plant, and an untreated check plot was last with an average of 20.64 forms per plant. On August 9, collections were made by making 300 strokes in each of the 9 plots. In the 2,700 strokes of a net, 1,283 hemipterous insects, or an average of 47.52 per

100 strokes, were collected. This was almost half the number collected in these plots in July when the first series of collections were made. Little change was apparent in the number of pentatomids present, but the Lygus spp. collections had been reduced from 44.3 per 100 strokes in July to 12.9 per 100 strokes in August. All six of the insecticide treated plots had smaller insect populations than any of the three check plots. The most striking change in relative position of the plots was in the case of the calcium-arsenate treated plot which jumped from ninth or last position in the July counts to first place in the August counts. The second boll examination was made August 16-18 when 300 bolls were taken from each plot. This examination followed the fifth application of insecticides to the treated plots. Of the 2,700 bolls examined, 31.37 percent were punctured by insects. The average in the six treated plots was 26.1 percent, and in the three untreated plots was 41.87 percent. Compared with the July examination, the percentage of punctures in the treated plots was reduced 1 percent while in the check plots it had increased 10 percent. As the treated plots also averaged six more forms per plant than the untreated checks, the indications are that in this test larger yields of cleaner cotton should result from the use of insecticides.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Supervision of regulatory measures.--The ginning of the 1937 cotton crop in the lower Rio Grande Valley district of Texas was in full swing throughout August. By the end of the month 138,000 bales had been ginned for the season and it was estimated that there will probably be about 2,000 more bales. The heavy ginning naturally kept all of the processing plants operating at full capacity. During the first few days of September a number of gins began closing for the season, and as each gin closes it is being given a thorough cleaning. In the other regulated districts the installation of new equipment and the repairing of equipment previously used has been continued. During the latter part of the month there was some ginning in all of the districts, and after a few minor adjustments had been made the equipment operated quite satisfactorily. Reports indicate that if pickers are available ginning will soon be in full swing in all districts.

Destruction of stalks.--One of the measures to be used in controlling the pink bollworm infestation in the lower Rio Grande Valley is the cutting or plowing up of cotton stalks after picking is completed so that there will be no further growth. State regulations require that this be done by the first of October. With the slackening up of ginning inspectors in this district are having more time to devote to the destruction of stalks. In Willacy County it is reported that from 85 to 90 percent of the fields are in the process of being plowed. The percentage is slightly lower in other parts of the valley, but at the same time the progress being made is very encouraging. In some instances it is reported that the ground is too dry for plowing, but it will be begun as soon as there is sufficient moisture. The destruction of stalks is being done by the farmers.

Road-traffic inspection.--The road-inspection station on the principal highway leading out of the lower Rio Grande Valley was in operation throughout the month, and approximately 14,500 cars were inspected and some 250

confiscations made. The confiscations continue to consist largely of small lots of seed cotton in the possession of pickers and other lots being carried as souvenirs. What is believed to be a record in road-station inspection was made on August 22, on which day approximately 3,000 cotton pickers were checked through the station. Most of these pickers were being moved in large trucks carrying from 30 to 50 people, and practically all of them carried their own pick sacks. Truck drivers are aware of the fact that when the sacks are fouled with cotton products much time is lost at the station; consequently they have been seeing that the sacks were cleaned by the pickers before leaving the area. This saves the truck drivers much time and also makes the work of our inspectors considerably easier.

Gin-trash inspection.--Gin-trash inspection was carried on throughout the month by from 10 to 12 crews. Inspections were made in the lower Rio Grande Valley district and in the cotton areas to the north and east. In the regulated area inspections were completed. Over 5,000 bushels of trash were examined and 23 specimens of the pink bollworm found. Of this number 1 was from Hidalgo County and 22 from Cameron County. It is of interest to note that inspections in the Corpus Christi section of Texas have been completed with negative results. Considerably more trash was inspected there this year than ever before, and it would seem that we could now feel assured that no infestation resulted from bringing in valley products prior to the discovery of the infestation in 1936. As the ginning season advances the inspection crews will be moved on up through central Texas. Gin-trash inspections were completed in the State of Tamaulipas, Mexico, which is opposite the lower Rio Grande district of Texas. Inspections were also made in the State of Nuevo Leon. A total of 2,363 bushels of trash was inspected in these two States and 660 specimens of the pink bollworm found, all of these being from Matamoros, just across the river from Brownsville, Tex. Early in July worms were found at Matamoros at the rate of 1.17 per bushel. About the middle of August some additional inspection was done to see whether or not there had been an increase in infestation. From 60 bushels of trash inspected 322 specimens of the pink bollworm were found, which is at the rate of almost $5\frac{1}{2}$ worms per bushel. It will thus be seen that the infestation built up considerably in a little over a month's time.

Laboratory inspection.--The inspection of material at the San Antonio laboratory was completed the latter part of July. During August a small amount of material was inspected at several of the field stations with negative results. Practically all material collected from the 1936 crop has now been inspected. At Miami, Fla., wild cotton bolls were inspected, 12 specimens of the pink bollworm having been found in the 4,886 bolls inspected. All of these came from Lower Matecumbe Key. This work has been completed.

Thurberia-plant eradication.--The destruction of Thurberia plants went forward throughout the month, with practically all of the work being devoted to a recleaning in both the Tortillita and Santa Catalina Ranges of southern Arizona. In the Tortillita Range more than 2,000 acres were gone over and only 138 seedling plants found. In the Santa Catalina Range 640 acres were gone over and 24,912 Thurberia plants destroyed. It is of interest to note

that practically all of these were plants which had come up since the previous cleaning. Just at the close of the month a very good supply of water began coming down the canyons in the Santa Catalina Range, and plans are being made to establish a new camp at once. It is estimated that this new camp site can be used for at least 2 months, as it will be in the center of several sections of land where many *Thurberia* plants are believed to occur. It has been necessary to construct 9 miles of new trail leading to this new camp, and a telephone line has also been installed so that constant communication can be maintained.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Paris green and hydrated lime effective against hornworms on disease-resistant types of shade-grown tobacco of Florida.--F. S. Chamberlin, of the Quincy, Fla., laboratory, reports that it has been determined that a mixture of paris green and hydrated lime in proportions of 1-6, by weight, may be applied to disease-resistant types of shade-grown tobacco at the rate of approximately 4 pounds per acre without appreciable discoloration of the cured product, and that such treatment functions as a satisfactory control of the tobacco hornworms *Protoparce sexta* Johan. and *P. quinque-maculata* Haw., if the larvae have not passed the third instar, and provided that the treatment is applied by the so-called "drift" method, whereby the dust is directed between the rows and permitted to drift over the plants. This mixture will also assist in controlling the tobacco budworm but cannot be relied upon to wholly control this pest. The paris green-hydrated lime dust mixture has the advantage of permitting a more uniform application and a lower quantity of paris green is required than when the undiluted material is used.

Relation shown between alfalfa culture and subsequent wireworm infestation.--E. W. Jones, of the Walla Walla, Wash., laboratory, reports that examinations of a potato field and an onion field in a plot where a 5-year-old alfalfa stand was plowed under and planted to truck crops in the spring of 1937 revealed that in the potato plot the population of the Pacific coast wireworm was less than 1 wireworm per square foot and that less than 4 percent damage was caused to a crop of early potatoes, whereas in the onion plot the population averaged approximately 1.3 wireworms per square foot and that this population caused a damage of approximately 11 percent. This observation corroborates previous evidence to the effect that truck crops may be grown with the expectation of only slight injury on land where alfalfa has been plowed under recently. The wireworm population in this field has been determined annually since 1930. Corn was planted in this field during 1930 and 1931 and was damaged severely by wireworms, which averaged eight per square foot. After 5 years of alfalfa, the population of this field was reduced to approximately one wireworm per square foot, on an average.

Dusts containing rotenone or pyrethrum not effective against adults of the cigarette beetle.--W. D. Reed and D. W. Hookom, of the Richmond, Va., laboratory, report that none of the dust mixtures containing rotenone or pyrethrum had a deleterious effect on adults of the cigarette beetle when

directed against these insects in tests simulating conditions which would be encountered in tobacco warehouses. In the instance of the dust mixtures containing rotenone, there was no appreciable difference between the percentage of mortality achieved against the treated insects and those in the checks. Pyrethrum dust mixtures containing a high percentage of pyrethrins were slightly more effective than the rotenone-containing dust mixtures, but in no instance did the pyrethrum compounds give a percentage of kill which would be satisfactory in practical operations against the cigarette beetle adults in tobacco warehouses.

Pea weevil parasites liberated at Moscow, Idaho.--T. A. Brindley, of the Moscow, Idaho, laboratory, reports that a total of 20,480 adults of the pea weevil parasite Triaspis thoracicus Curtis were received at Moscow, during the month of July, and liberated in the field under conditions that would appear favorable for this parasite to become established. These parasites originated in Europe and were furnished through the cooperation of the Division of Foreign Parasite Introduction. The parasite material was shipped to Moorestown, N. J., reared at that point, and reshipped to Moscow through the cooperation of the Division of Cereal and Forage Insect Investigations. The insects were received at Moscow in excellent condition, with a mortality of only 5.7 percent. Releases were made in two situations.

Control of greenhouse mealybug on Saintpaulia.--C. A. Weigel and F. F. Smith, of the Beltsville, Md., laboratory, report that satisfactory control of the greenhouse mealybug (Pseudococcus citri Risso) on Saintpaulia plants has been obtained in recent experiments by dipping them in one of several solutions including the following: (1) An aliphatic thiocyanate at a dilution of 1-300 with a light oil (0.5 percent) added as a spreader, (2) a lauryl thiocyanate diluted 1-600 without a spreader, and (3) a mixed thiocyanate containing lauryl, octyl, decyl, and myristal alcohols (1-600 or 1-300) plus a light oil spreader (0.5 percent), or with an alkylphenylbenzene-sulfonic acid (1-300) used as a spreader. Since some temporary plant injury resulted at the 1-300 dilutions of the primary insecticides, it appears safer to use the 1-600 dilution with the light oil spreader. Infested Saintpaulia plants fumigated in a chamber at the rate of 2 ounces of calcium cyanide to 1,000 cubic feet resulted in a 98-percent kill of P. citri nymphs and adults, but the eggs survived. In other tests where the plants were subjected to two exposures with a dosage of $1\frac{1}{2}$ ounces and another at 1 ounce, respectively, a high mortality of the nymphs and adults was obtained. These fumigations caused severe temporary injury to some of the treated plants, but such injury was outgrown eventually and the plants flowered freely. Based upon these experiments it appears that the successful fumigation of Saintpaulia plants for P. citri would require several treatments at intervals of approximately 1 week.

Epsom salt valueless as control for Mexican bean beetle.--A recent article in a scientific periodical indicated that magnesium sulphate (Epsom salt) used as a spray, in the proper concentration, constitutes an effective control of the Mexican bean beetle. Although experiments performed by N. F. Howard of the Columbus, Ohio, laboratory, in 1928 had demonstrated that this material was not toxic to the Mexican bean beetle, it seemed desirable to

repeat these tests during 1937, since many inquiries were being received regarding the status of Epsom salt as an insecticide. Laboratory tests with E. varivestis larvae performed by R. A. Fulton at Columbus, using dilutions of Epsom salt 100 times as great as the lethal dosage of calcium arsenate, showed that the larvae fed on the treated bean foliage, that they consumed as much leaf area as the larvae placed on untreated foliage, that they molted successfully, and that there was no resulting mortality which could be attributed to Epsom salt.

Screening of tomato seedlings aids in preventing ravages of curly-top disease.--According to reports submitted by H. E. Dorst, of the Logan, Utah, laboratory, the placing of cheesecloth covers over tomato plants during the period of migration of the beet leafhopper has served to aid in protecting these plants against the subsequent development of the curly-top disease, sometimes known as the "Western yellow blight", which is transmitted by Eutettix tenellus Bak. Plots of tomatoes which were covered until June 12 showed only 15 percent of the plants affected by the disease, whereas tomatoes that were not protected and grown under comparable conditions were infected to the extent of approximately 40 percent. These plots were planted on May 1.

INSECTS AFFECTING MAN AND ANIMALS

Meadow mice excellent hosts for larvae of American dog tick.--Studies on the wild animal hosts of the American dog tick show that meadow mice (Microtus spp.) are well-adapted hosts of this parasite. In one instance 942 seed ticks completed engorgement on a single animal without fatal results. It is interesting to note that, on a rabbit infested with approximately the same number of seed ticks as the mouse and during the same period of time, only 28 ticks completed engorgement.

Cattle tick has variety of domestic animal hosts in Puerto Rico.--The following summary of collections of Boophilus annulatus australis Fuller from domestic animals during August 1937 by H. W. Tate in various localities in Puerto Rico indicates quite clearly that the treatment of livestock other than cattle must be considered in attempts to eradicate the tick on the island.

		Animals	
Type of animal	Locality	Examined	Infested with <u>Boophilus annulatus australis</u>
		Number	Number
Goat-----	Ponce	2	0
Do-----	Aguirre	6	1
Do-----	Guayama	14	1
Do-----	Juana Diaz	43	23
Sheep-----	Aguirre	95	66
Do-----	Juana Diaz	70	2
Do-----	Juana Diaz	14	4
Do-----	Ponce	50	2
Horse-----	Ponce	11	0
Do-----	Juana Diaz	10	0
Do-----	Juana Diaz	11	0
Dog-----	Mayaguez	16	7

Mosquito-eating fish show unusual hardiness.--H. H. Stage, of the Portland, Oreg., laboratory, reports that a stock of Gambusia planted in a heavily polluted pond in Multnomah County in 1935 have multiplied greatly. This is particularly interesting because of the abnormally low temperatures experienced in that section last winter. During February 1937 the pond was frozen for several days.

Oil-pyrethrum extract mixture appears to be good repellent for sandflies.--J. B. Hull, of the Savannah, Ga., laboratory, reports excellent results with a mixture of S.A.E. 10 lubricating oil and pyrethrum extract for keeping sandflies out of houses. The mixture is sprayed on the screens of doors and windows and retains its repellent value for several hours.

Norway rat important host of American dog tick.--Studies by C. N. Smith on the wild animal hosts of the American dog tick on Martha's Vineyard, Mass., indicate that the Norway rat is fairly commonly infested with the immature stages of the tick in that locality. The tick had been collected previously from this species of rat in other places but not in such large numbers as those found on the animals on Martha's Vineyard.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Six living larvae of the West Indian fruit fly (Anastrepha acidusa Walk.) were intercepted at San Juan, P. R., on May 19 in Malay apple (Eugenia malaccensis) in the mail from Dominican Republic. Five living larvae of the Mexican fruit fly were intercepted at New York on April 29 in a mango in baggage from Honduras. A living larva of Psylliodes chrysocephala L. was taken at New York on April 1 in the stem of white-sprouting broccoli (Brassica oleracea italica) in ship's stores from Italy, and two living larvae of this chrysomelid were also taken at New York on April 9 in a leaf stem of cauliflower in ship's stores from Italy. Living specimens of the scale insect Lepidosaphes (Coccoomytilus) halli Green were found at Washington, D. C., on March 13, 1936, on apricot trees in the mail from Damascus, Syria. Living specimens of the thrips Frankliniella ingentissima Pr. arrived at the airport at Brownsville, Tex., on December 22, 1936, on gardenias in cargo from Mexico. J. C. Crawford reports this to be a first record. A living adult of Bruchus tristiculus Fahr. was intercepted at Mobile, Ala., on May 26 in a vetch seed in cargo from Hungary. Specimens of the scale insect Odonaspis ruthae Kot. arrived at Honolulu, Hawaii, on September 9, 1936, on a grass (Lepturus repens) in baggage from Christmas Island. Two living larvae of the yam weevil (Palaeopus costicollis Marsh.) were taken at Boston on June 7 in a sweetpotato in ship's stores from British Guiana. The scale insects Florinia japonica Kuw. and Poliaspis pini Mask. were found at Philadelphia on February 3 on dwarf pine trees in ship's furnishings and quarters from Japan. A living adult of the weevil Tetrabothynus spectabilis Boh. was intercepted at New Orleans on June 1 on a pineapple fruit in cargo from Cuba.

Fruit fly interceptions at Laredo.--A returning family arrived on the bridge at Laredo and declared they had no fruit or plants from Mexico. The inspector, while examining the car, picked up a paper bag from the floor and asked what it contained. The girl replied, "That is a little, old, dried-up peach--it don't amount to anything." The inspector took it up and continued to search the car, finding two oranges concealed in the dash compartment. The lady had a purse beside her on the seat and the said nurse looked "too fat." The inspector asked what was in it. The lady replied, "Nothing--just the usual things." He then requested that she open it, which she did rather indignantly. It contained a mango. The usual fine of \$1 was assessed by the customs official. Later, on examining this fruit, 1 fruit fly larva was taken from the peach, and 33 fruit fly larvae were taken from the mango. A couple from the State of Washington arrived on the bridge at Laredo, coming from Mexico. When asked if they had any fruits or plants, they declared six pineapples. The inspector found the 6 pineapples, also a bag containing 17 mangoes, which they had failed to declare, but no attempt had been made to conceal. The woman protested bitterly against giving up the mangoes, and insisted that she be allowed to eat them right then and there, which request was, of course, refused. Later 10 fruit fly larvae were taken from 3 of these 17 mangoes. The inspector in charge at the footbridge, on going to work one morning, found the following note on the bulletin board, left by the inspector on duty the night before: "I picked 110 fruit fly larvae out of 1 mamey--take a look." A family of tourists arrived on the bridge at Laredo--father, mother, and two small children--coming from Mexico. They were from one of the Northern States and had not heard very much about fruit fly damage or come in contact with fruit fly larvae. When the plant quarantine inspector took two nice oranges from the lunches they had purchased in Mexico, he explained that the fruit was the host of the Mexican fruit fly and was prohibited entry into the United States by Federal quarantine. They were nice about it and willing to give up their fruit, though they were a little bit hurt and felt that they were being imposed upon or taken advantage of, just why they did not fully understand. It so happened that one of the inspectors had just been relieved and was inside the office cutting up fruit that he had taken up. Among this fruit were two infested oranges from which he had just removed some fruit fly larvae, and five large, fat, wiggling larvae had been placed in a test tube preparatory to boiling. The inspector took these into the customs office, sought out the people from whom he had just taken the two oranges and showed the larvae to them, saying, "We just took up your two oranges. You were nice about giving them up, didn't object, but probably do not understand just why we took them. These larvae only a few minutes ago were taken from some oranges from Mexico. I thought you might like to see them in order that you may better understand why we do not let Mexican oranges come into the United States." The people were immediately interested, viewed the larvae, asked many questions about them, and thanked the inspector for showing the larvae to them and for taking their oranges away from them.

Pathological interceptions of interest.--Evidence pointing to wide distribution of Anguina tritici (Steinb.) Filipjev in northern China was found when 26 out of 111 samples of wheat from that source were found to be

infested when inspected June 15 at Washington. Cercospora albomaculans (E. & E.) Sacc. was intercepted May 19 at Seattle on cabbage from Japan. Glomerella cincta (Ston.) Spauld. & Schrank was intercepted on orchid leaves from Siam July 23 at New York. Our first interceptions of Hemileia oncidii Griff. and Maubl. were made at Washington, May 7, on Oncidium varicosum rogersii from a greenhouse in England and on May 11 and 12 on wild species of Oncidium from Brazil coming in under special permits. Phyllosticta codiaeicola Died., first interception, was found at New York on Codiaeum cuttings in baggage from Bermuda. Sclerotium bataticola Taub. was found on sweet-potatoes from India April 2 at Washington. Urocystis occulta (Wallr.) Rab. was found on rye straw packing from Poland at New York. Our first interception of Uromyces loti Blytt was made at Washington January 27 on lotus from Turkey. U. trifolii (Hedw. F.) Lev., first interception, was found on clover leaves and stems in packing from Bermuda April 29 at New York.

DOMESTIC PLANT QUARANTINES

White-fringed beetle found in Mississippi.--The occurrence of the white-fringed beetle in Laurel, Miss., reported early in August, was found on investigation to represent a new center of infestation, more remote from the original center in the Alabama-Florida area than any yet found. The infested area covers approximately $1\frac{1}{2}$ square miles in the city of Laurel, in the vicinity of three railroad rights-of-way and a lumber yard. The limits of the infested area are believed to have been determined, two Federal inspectors and seven Mississippi State inspectors having carefully inspected this area including the highways and railroad rights-of-way for a considerable distance out of the city. Seventy-five percent of the beetles found were dead. It is difficult to find larvae, the inspectors report, and no pupae were found. Barrier ditches have been constructed in the city alleys, streets graded in the infested area, weeds and grass on roadsides and vacant lots burned by pressure burners, and railroad and industrial yards cleaned up.

White-fringed beetle situation in Alabama and Florida.--As a result of continued inspection for the white-fringed beetle with a force of 55 to 60 Federal and State inspectors in the region of the infested counties of Alabama and Florida, and the Gulf coast area, an infestation of the white-fringed beetle was found on railroad yards at Pensacola, Fla. One new infestation was also located at Laurel, Okaloosa County, Fla., a county in which the beetle has previously been found. The work has included a close examination of fields, gardens, fence rows, and the premises of gins, mills, and industrial yards in the vicinity of known infestations and hundreds of miles along highways and railroad rights-of-way. All areas around isolated infestations, including properties on which tenants live who have moved from the infested area, are inspected to determine whether any beetles might have been transported with crops or other effects, but no infestation has been found that could be traced to such movement. Barrier ditches are sprayed with kerosene one to five times a week, and checked for frequently needed repairs resulting from rains. Inspection for the purpose of cooperative enforcement of State quarantines is made of such commodities as farm produce,

cotton, and forest products, soil, scrap iron, household goods, and livestock moving from the infested areas. The movement of cotton products requires the issuance of from 500 to 900 permits weekly.

Woodlands inspected for the white-fringed beetle.--In addition to the regular survey for the white-fringed beetle, several inspectors are searching woodlands in the vicinity of infested fields to determine if established infestations exist in cut-over or forested land. The finding of larvae in such lands at relatively short distances from infested fields indicates that infestations may become established and survive in such growth. Native host plants have also been located in woodlands on which adult beetles were feeding.

Progress in sweetpotato weevil control.--Inspection for the sweetpotato weevil was continued in August in a belt of 36 counties extending through the southern parts of Alabama and Mississippi, central Louisiana, and northeastern Texas, and the work is approaching the point of setting up a definite cooperative control and eradication program in each of the States. Inspections to date have been chiefly confined to the seedbeds and infestations have been found during the season in each of the above States. When the weevils are found, the survey work is intensified for the purpose of determining whether the infestation is local or general, particularly on the outer rim of the known infested area, the inspection generally covering a radius of 3 to 10 miles of such areas. Eradication is carried on along with the survey work and owners of infested seedbeds are removing and destroying the vines and tubers. The limits of areas in which the eradication project will be conducted has been determined in six counties in Mississippi.

Peach disease control activities.--In the eradication of abandoned and worthless peach trees for the control of the peach mosaic and phony peach diseases, operated as relief projects, field leaders have centered their efforts during the past 2 months on diseased trees, and a larger number of relief employees have been working in July and August in order that trees infected with these diseases may be removed at the time of inspection, thus reducing the possible spread of infection to a minimum. As a result, more diseased trees have been removed during the past 2 months than were so removed during the same period last year. In August, an average of nearly 600 persons were employed in tree removal work in Alabama, Arkansas, California, New Mexico, Tennessee, and Texas. Inspection for the diseases was conducted in August in Alabama, Arizona, Arkansas, California, Colorado, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas.

Citrus canker eradication.--The August work on citrus canker activities represented the completion of the removal of abandoned host plants in Mobile County, Ala., the continuation of such work in Baldwin County, Ala., and in West Florida with reduced crews of relief laborers. In Texas reinspections in the counties of Jefferson, Orange, Brazoria, and Galveston resulted in finding no citrus canker in areas known in recent months to represent infection centers. Relief laborers in Texas continued the removal of abandoned citrus trees located by the inspectors.

Transit inspection activities.--The inspection of railway produce cars originating in areas infested with the Japanese beetle was continued in August at the regular inspection points in the Middle West and also under brief assignments at Detroit, Cleveland, Toledo, and Columbus, Ohio, with the result that only one live Japanese beetle was found during the month in such shipments. This was at Chicago. While the month of August generally shows a marked decline in plant shipments of commercial origin, the Kansas City inspector found there was an increase in the consignments of noncommercial plant shipments, resulting in the interception of twice as many violations in August as in July. Summer inspection has not heretofore been conducted in Kansas City, and the results of the present assignment show that such activity is fully justified.

CONTROL INVESTIGATIONS

Paired lateral vessels found extending from the heart in the cockroach.--In an investigation of insect heart morphology, N. E. McIndoo, of the Beltsville laboratory, has found paired lateral vessels extending from the heart in the cockroach Periplaneta americana, thus confirming the observations of Alexandrowicz. These vessels seem to be plugged with loose tissue at their junctions with the heart and appear gradually to become smaller as they extend away from the heart. Their functions have not been determined.

Ethyl bromide as a fumigant.--In recent work on fumigation for Japanese beetle, A. C. Johnson and J. W. Bulger tested ethyl bromide in comparison with methyl bromide. It was found that whereas methyl bromide gave a complete kill of the adult Japanese beetle at a dosage of 1 pound per 1,000 cubic feet, no kill was obtained with ethyl bromide when used under the same conditions, even with a dosage of 13 pounds per 1,000 cubic feet.

INSECTICIDE INVESTIGATIONS

Determination of minute quantities of nicotine vapor.--H. H. Richardson and R. L. Busbey have recently described a laboratory apparatus for the fumigation of aphids with low concentrations of nicotine [Jour. Econ. Ent. 30(4): 576-582. 1937]. The method of determining the concentration of nicotine vapor used in these tests is that devised by J. R. Spies, of the Division of Insecticide Investigations, and described in Industrial and Engineering Chemistry, Analytical Edition, volume 9, pages 46-47. Richardson and Busbey found that as little as one part nicotine per million parts air killed large numbers of the peach aphid.

Manufacture of nicotine peat.--L. N. Markwood [Jour. Econ. Ent. 30 (4): 643-651. 1937] has just published a description of the semicommercial manufacture of nicotine peat. From New Jersey reed peat a product was made that contained 10.6 percent total nicotine, of which 9.3 percent was insoluble in water at a dilution of 1-2000.

Isolation of rotenone from Tephrosia toxicaria.--H. A. Jones and W. N. Sullivan [Jour. Econ. Ent. 30(4): 679-680. 1937] have for the first time reported the isolation of rotenone from the South American plant Tephrosia toxicaria. Against houseflies the best sample of this plant showed a toxicity equivalent to a rotenone content of about 3 percent.

Surface tension of soap solutions.--H. L. Cupples [Indus. Engin. Chem., Indus. Ed., 29(8): 924-926. 1937] has continued his study of the wetting and spreading properties of aqueous solutions. He has shown that the surface tension of a soap decreases with increase in molecular weight of the fatty acid. The curves for the palmitate, myristate, oleate, laurate, and n-caprate are close together and form a rather distinct group from the curves for the n-caprylate and n-caproate, which are more widely separated from each other and from those of the acids of higher molecular weight. The wetting power of a soap solution, as measured by its spreading coefficient on mineral oil, is closely related to its foam-producing power, dirt-suspending power, and efficiency as a detergent. Others have shown that the wetting power of a contact spray is directly related to its insecticidal efficiency. The influence of wetting power in sprays that function as stomach poisons or protective fungicides merits investigation.

BEE CULTURE

Physocerphala affinis, a parasite of the honeybee.--Various dipterous parasites of the honeybee have been reported in the past but the recent identification by D. G. Hall, of the Division of Insect Identification, of certain parasites on bees sent the Division of Bee Culture from North Dakota as Physocerphala affinis Will, of the family Conopidae, is of special interest since this insect has been rarely, if ever, reported before as a parasite of the honeybee, in this country at least.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Another beetle found boring in lead cable.--A beetle recently submitted for identification was accompanied by the report it had been found actually boring into the lead sheathing of aerial telephone cables at Greenville, Miss. A coating of black paint and sand had been penetrated before the cable itself was entered. More than 20 short circuits during the past summer were attributed to this species, which has been identified by W. S. Fisher as Schistoceros hamatus F., of the family Bostrichidae.

A remarkable blind beetle discovered in Texas.--Several specimens of a minute, blind, and wingless beetle that had been taken in the Bay City Rice Mill, Bay City, Tex., were recently received for determination. They have been identified by W. S. Fisher as Thaumaphrastus karanisensis Blaisdell (Colydiidae), which was originally described from a fragmentary specimen taken in a grave in the buried ruins of an old Egyptian city. Wild rice was frequently placed with the body at burial and it is presumed that the insect entered the grave in this manner. Specimens of the same species were intercepted earlier this year at Thayer, Tex., in Oryza sativa coming from Mexico.

A species of Buprestidae reported injurious to cotton.--Beetles said to be cutting off the branches of cotton stalks at Grandfalls, Tex., were submitted for identification by R. A. Vickery and have been determined by W. S. Fisher as Psiloptera drummondi C. & G. (Buprestidae). No injury of that character has previously been reported for this buprestid, the only available record indicating that the adults feed on flowers of certain plants. The larvae are unknown. The infested cotton field is bordered by a row of dead and dying cedars. Very possibly the larvae of P. drummondi are developing in those trees, which would account for the unusual occurrence of the adults in the cotton field.

Damage to strawberries by larvae of Acrolophus.--There were recently received for determination moths of two species of the genus Acrolophus (Tineidae) which had been reared from larvae taken in strawberry fields in southeastern Virginia. They have been identified by August Busck as A. arcanellus Clem. and A. plumifrontellus Clem. H. G. Walker, of the Virginia Truck Experiment Station at Norfolk, submitted the material with the report that several acres of strawberries had been almost completely destroyed. The larvae remain during the day in tubes constructed among the grass roots and feed only at night. Because of this habit their abundance may easily be underestimated and injury caused by them attributed to other forms.

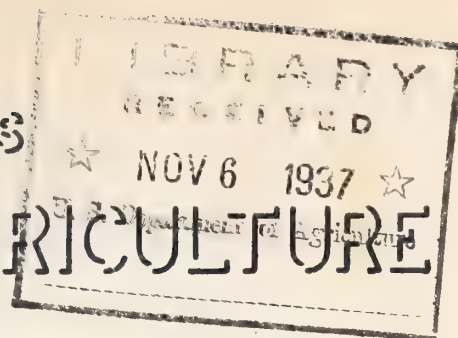
Melissopus latiferreanus a pest of apricots in California.--Ralph H. Smith, of the University of California at Los Angeles, recently forwarded for determination two moths reared from larvae infesting apricots in San Bernardino County, and reported that 10 percent of the fruit had been attacked. The species was identified by Carl Heinrich as Melissopus latiferreanus Wlsm. The normal hosts for the larvae are oak acorns and oak galls, although beech nuts, chestnut burrs, and walnuts are also attacked. No previous record has been available for the occurrence of this species as a pest of apricots.

A membracid injurious to chrysanthemums.--Specimens of a species of Membracidae found by H. L. Dozier to be causing serious injury to commercial plantings of chrysanthemums at Opelousas, La., have been identified by P. W. Oman as Vanduzee segmentata Forel. This species was not previously known to occur in Louisiana.

A European leafhopper attacking elms in the United States.--Specimens of a leafhopper reported by G. F. Knowlton to be damaging Siberian elms at Roosevelt, Utah, September 2, 1937, have been tentatively identified by P. W. Oman as Empoasca punctum Haupt, a species originally described from Germany. In connection with this determination records of species of Empoasca occurring on elm were requested of Nancy H. Wheeler, of the Arlington Experiment Station, who kindly furnished specimens collected from European elm at Chestnut Hill, Pa., August 3, 1930, by F. F. Smith. Upon examination these proved to be identical with the Utah specimens. In addition to these two records, the National Museum collection contains three females, which appear to be the same species, from Talcauaia, Union of Soviet Socialist Republics.

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DEPARTMENT OF AGRICULTURE



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UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

NEWS LETTER

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November 1, 1937

LEON HOWARD WORTHLEY

Leon Howard Worthley, in charge of two of the Bureau's most extensive control campaigns, the eradication of the Dutch elm disease and Japanese beetle control, with headquarters at Bloomfield, N. J., died on October 9 at Montclair, N. J., after an illness of several months. His wife, Mrs. Harriette Worthley, survives him.

Mr. Worthley was born in Skowhegan, Maine, in 1877. He attended public school at Skowhegan and at Lynn, Mass. Before entering the Government service in 1912, he had been a scout employed by the Massachusetts State Board of Agriculture for the eradication of the gypsy moth, a general contractor for the eradication of brown-tail and gypsy moths, local moth superintendent of Saugus, Mass., State agent in charge of gypsy and brown-tail moth work for 30 cities and towns in Massachusetts, and assistant State superintendent of gypsy and brown-tail moth work for Massachusetts.

In 1919 Mr. Worthley was assigned to the European corn borer control and regulatory work of the Bureau of Entomology. In 1927 he was given charge of an intensive corn borer campaign, for which Congress appropriated \$10,000,000. In 1930 he was given the job of administering the Japanese beetle quarantine and went back to New England to establish joint headquarters there for the two activities. Later, the tremendous task of eradicating the Dutch elm disease was added to Mr. Worthley's other duties.

E. G. BREWER NAMED HEAD OF JAPANESE BEETLE CONTROL
AND DUTCH ELM DISEASE ERADICATION

Erle G. Brewer has been appointed to succeed Mr. Worthley as leader of the Japanese Beetle Control and Dutch Elm Disease Eradication Division. Mr. Brewer has been associated with the work of the Division he now heads almost continuously since 1906.

WHITE ARSENATES TO BE COLORED PINK

W. N. Watson, secretary of the Manufacturing Chemists' Association, has advised the Bureau that the members of the association have voluntarily agreed to adopt a pink color for all white arsenates and that all of the materials produced for the coming season will be colored pink. This color will be used for the calcium arsenate, lead arsenate, and magnesium arsenate, and, except for the stock which is now on hand, these standard insecticides will be colored pink.

NICARAGUAN LOCUST BONUS

A Managua, Nicaragua, cable to the New York Times says the government, in its warfare against locusts, which destroyed the greater part of the country's cotton, corn, and bean crops, yesterday began paying a bonus of 30 cents for a 5-gallon tin filled with the insects. Nicaragua recently passed a law providing for a package tax on all imported merchandise, the proceeds to be used to combat the locust plague.

LARGE SEIZURES OF UNFIT FOODS IN AUGUST

Federal authorities were active during the summer in rounding up food products that had been carelessly packed and handled, the current report of the Food and Drug Administration indicates. Seizures of perishable articles increased in number and canned, dried, and other processed foods continued to demand careful attention. Food products seized because of unwholesome condition included 60,000 pounds of moldy, dirty, and insect-infested prunes; 200 pounds of wormy, rancid, and decomposed walnut meats; 76 crates of maggoty blueberries and huckleberries; 1,760 sacks of weevily flour; 13 shipping cases of canned mustard greens containing insects; and 59 cases of apple butter containing insect particles. More food seizures in August involved 233 bushels of apples, 18 bushels of pears, 29 crates of cherries, and 39 crates of currants, all carrying dangerous quantities of spray residue.

FRUIT INSECT INVESTIGATIONS

Second-generation eggs of plum curculio below normal.--Studies conducted this year by O. I. Snapp and J. R. Thomson, Jr., of the Fort Valley, Ga., laboratory, indicated that the percentage of first-generation plum curculio that deposited second-generation eggs during the same year was less than usual. Thirty percent of the first-generation females failed to deposit second-generation eggs. No second-generation eggs were deposited in September.

Brushing peaches to remove lead residue.--Mr. Snapp reports that peaches sprayed this year with lead arsenate, according to the regular schedule, showed on analysis 0.022 grain of lead per pound of fruit before brushing. This was reduced to 0.013 grain by passing the fruit through a commercial brushing machine before shipment.

Notes on the Mediterranean fig scale.--C. K. Fisher, of the Fresno, Calif., laboratory, made records on the life history of Lepidosaphes ficus Sign. in the Fresno area from May through July 1937. Hatching of first-brood eggs had been observed to begin about April 23 and eggs of this brood were found until July 22, or 2 months after hatching began. Crawlers of the first brood had settled down by May 4 and winged males were seen on May 25. By June 1 eggs of the second brood were present and some had hatched by June 17. Many second-brood crawlers had formed scales by July 8. On July 21 approximately 75 percent of the eggs of this brood had hatched.

Colonization of Japanese beetle parasite.--J. L. King, I. M. Hawley, L. B. Parker, and M. H. Brunson, of the Japanese beetle laboratory at Moores-town, N. J., have reported on colonization of several strains of Tiphia popilliavora Roh., an imported parasite of the Japanese beetle. Of the adults of the Korean strain of material reared in the laboratory, part of the females were mated and used for further rearing of stock for colonization next year. The rest of the adult females were used for colonization purposes this season, four colonies being released in Delaware, three in New Jersey, and two in Pennsylvania. Local field-collected females of the Koiwai strain were used for colonization. In the continuously infested beetle area 20 colonies were released--3 in Delaware, 7 in Maryland, 2 in New Jersey, and 3 in Pennsylvania. In addition five colonies were released in Connecticut.

Distribution and abundance of Japanese beetle in area of continuous or general infestation.--T. N. Dobbins, Moorestown, reports that the area of continuous or general infestation in 1937 is tentatively estimated at approximately 13,851 square miles, an increase of 2,451 square miles over the estimate made in 1935. The distribution by States is as follows: New Jersey, 6,980 square miles; Pennsylvania, 4,358 square miles; Delaware, 946 square miles; New York, 853 square miles; Maryland, 664 square miles; and Connecticut, 45 square miles. Throughout the area of general infestation beetles were not generally as abundant in 1937 as during the preceding two seasons. The reduction, as indicated by foliage injury, was most marked throughout New Jersey and the immediately adjacent sections of eastern Pennsylvania, with the most striking reduction in north-central New Jersey, in Mercer, Middlesex, Somerset, and Hunterdon Counties. Throughout considerable parts of Maryland, Delaware, and eastern and southeastern Pennsylvania foliage injury was definitely not as heavy and extensive in 1937 as in the preceding year, particularly north of the Schuylkill River, although local areas of extremely heavy damage developed in parts of these States. Throughout the entire area the reduction in foliage injury appears to be closely correlated with the drought conditions that existed during the summer of 1936.

MEXICAN FRUIT FLY CONTROL

Still no Mexican fruit fly.--Continued hot and dry weather throughout September retarded the development of citrus fruit in the Rio Grande Valley to a marked degree. At the close of the month the fruit in very few groves would pass the State maturity tests and in general had failed to take on the customary size for this period of the year. It is believed that fruit in

sufficient quantities will have passed the maturity tests by October 15 and that regular shipments will begin near that date. Trapping operations were continued but fewer specimens were taken than during any previous month this season. None of the specimens trapped was Anastrepha ludens Loew. The numbers of fruit flies identified in September are shown in the following table.

Species	:	Texas	:	Mexico
Adults trapped	:	Number	:	Number
<u>Anastrepha serpentina</u> Wied.-----	:	15	:	1
<u>A. pallens</u> Coq.-----	:	64	:	0
Total-----	:	79	:	1
Larvae collected	:		:	
<u>A. ludens</u> Loew-----	:	0	:	12
<u>A. serpentina</u> -----	:	0	:	82
<u>Rhagoletis</u> sp.-----	:	0	:	23
Total-----	:	0	:	117

CEREAL AND FORAGE INSECT INVESTIGATIONS

Second brood of *Melanoplus mexicanus* Sauss. in Kansas.--W. T. Emery of the Manhattan, Kans., laboratory, reports that in collaboration with J. R. Parker, an experiment to determine the development of a second brood of *M. mexicanus* was begun in June at Manhattan. From 25 to 30 females, together with a similar number of males, were placed in a cage and fed green alfalfa for a period of 2 weeks. The old hoppers and their food were then removed. Observations were made to detect any appearance of newly hatched grasshoppers. It required from 17 to 27 days from the time the mature hoppers were placed in the cage until young hoppers of this species began hatching.

Corn-borer infestation in early market sweet corn in Ohio.--A. M. Vance, Toledo, Ohio, reports that over the period 1934-37, inclusive, there has been a steady increase in corn borer abundance in early market sweet corn near Toledo. All of the 25 fields examined in 1937 carried populations of over 500 borers per 100 plants, with an average of 794 borers per 100 plants. In these fields, practically 90 percent of the plants were infested, with an average of over 8.8 borers per infested plant. The following table gives a summarized comparison of corn borer infestation in early market sweet corn for the period mentioned.

Period of survey			Borers per		Fields with average	
	Fields	Acres	100 plants		of over 500 borers	per 100 plants
			Average	Maximum		
	Number	Number	Number	Number		Percent
1934, July 30-Aug. 8-	15	51	268	5358		6.7
1935, July 23-Aug. 9-	25	119	328	560		16.0
1936, July 28-Aug. 3-	25	114	469	990		24.0
1937, Aug. 5-Aug. 13-	25	116	794	1,294		100.0

1/One exceptional field in 1934 had a population of 1,018 borers per 100 plants.

Oviposition of second-generation corn borer at New Haven, Conn.--Mr. Vance also reports that oviposition of second-generation moths in the New Haven district in 1937 was the heaviest recorded since the initiation of this type of study in 1934. The total numbers of second-generation masses, found on 200 plants in each of the 4 years, were as follows: 518 in 1934, (Hartford); 758 in 1935; 419 in 1936; and 1,420 in 1937. The average number of eggs per mass in 1937 and in 1936 was practically the same--17.9 and 17.8, respectively; in 1935 the average was 18.4. In 1937, 83.2 percent of the total oviposition had occurred by August 13, whereas in 1936, 64.9 percent had taken place by the same date. The data obtained on second-generation oviposition at New Haven in 1937 and in 1936, are presented in the following table.

Date	Accumulated egg masses on	
	200 plants	
	1937	1936
	Number	Number
July 24-----	-	1
28-----	-	5
31-----	-	21
August 3-----	163	51
5-----	275	108
7-----	464	136
9-----	747	159
11-----	990	210
13-----	1,182	272
16-----	1,274	307
18-----	1,357	380
20-----	1,401	399
24-----	1,416	414
26-----	1,420	419

Field tests of sprays for European corn borer control.--D. D. Questel, Toledo, reports the favorable performance of various fluorine compounds applied to early market sweet corn in the vicinity of Toledo during the current season. These compounds compared favorably with ground derris. Although some of the fluorines caused considerable injury to plant tissue, the

plants seemed to recover and by harvest time most of them produced large well-filled ears. Phenothiazine and the various nicotine combinations tested exhibited a relatively low effectiveness in these tests, possibly owing to the hardness of the water available.

Physiological effects of nutrients in food plants supplied the European corn borer.--G. T. Bottger, Toledo, reporting on progress of studies of the nutritional requirements of the corn borer, utilizing certain common weeds and crop plants as feeding media, indicates an important association between the chemical composition of these various media and their suitability as food for the larvae. Foods of relatively high carbohydrate content at time of feeding resulted in very favorable responses by the developing larvae, as measured by percentage of larval survival, average weight per borer, and rate of development determined by percentage of pupation at intervals of 30 and 40 days after hatching. In comparing the survival, on the internodes of the stalk between the different types and strains of corn, the differences between borer survival on the susceptible strain A X TR and the resistant strains Hy X R4 and Maize Amargo are most impressive. The survivals on either Hy X R4 or Maize Amargo amounted roughly to 75 percent of that occurring on A X TR. That pupation on Hy X R4 reached only 66.6 percent of that on A X TR and that the average weight of borers from Hy X R4 was only 78 percent of those reared on A X TR internodes also appears to be significant. That a nutritive difference exists between the two strains of corn seems further substantiated by the fact that only little more than one-third as many borers survived on the leaves of Hy X R4 as on those of A X TR, that the weights of the surviving larvae averaged only about three-fourths the weight of those from A X TR, that none of the larvae on the leaves of Hy X R4 pupated, but that nearly 14-percent pupation occurred among larvae on leaves of A X TR. While larval survivals on some other vegetable crop media have compared favorably with those in corn, higher rates of pupation are associated with development on various parts of corn plants than from any other medium. Pupation on sweet corn kernels reached 38.6 percent 40 days after hatching, as compared with a maximum of 12.5 percent on green beans under comparable conditions. Mechanical factors also contribute materially to borer development. Such conditions of food as heavy pubescence, hard, woody fiber, and unfavorable moisture content operate greatly to the disadvantage of the developing larvae, either on initial establishment or in the subsequent growth of those larvae that survive this initial period.

Biological differences in multiple- and single-generation strains of European corn borer.--K. D. Arbuthnot, New Haven, Conn., commenting on current progress of studies designed to establish possible biological differences between various "strains" of the European corn borer, reports that attempts to obtain mating when pairs of adults were placed in pint ice cream-container cages proved satisfactory. Mating, as evidenced by the production of fertile eggs, was obtained when five male and female moths were placed in pint cages. All combinations--multiple-generation males and females, single-generation males and females, multiple-generation males and single-generation females, and single-generation males and multiple-generation females--produced fertile eggs in these tests.

Summer parasitization of European corn borer.--E. D. Burgess, Moorestown, N. J., reports that field collections of corn borer larvae at Malden, Mass., show the definite establishment of Phaeogenes nigridens Wesm., a pupal parasite imported from Europe and released in the area prior to 1934. The total parasitization in the area surveyed was 8.75 percent, principally by Inareolata punctoria Roman, which, owing to undetermined factors, is the lowest summer parasitization that has prevailed since 1929.

European corn borer parasite emergence from imported and domestic material.--C. A. Clark, Moorestown, reports that the total emergence in the laboratory of European corn borer parasites for colonization purposes was as follows: I. punctoria, 10,979; Lydella grisescens R. D., 7,778; Chelonus annulipes Wesm., 2,032; Labrorychus prismaticus Nort., 180; and Bassus agilis Cress., 48.

Liberations of corn borer parasites in 1937.--C. A. Clark, Moorestown, states that 21,425 parasites of the European corn borer were released in 8 States in 1937, as shown in the following table.

	Parasite species						
State	Inareolata:	Lydella	Chelonus:	Bassus:	Labrorychus:	Total	
	punctoria	grisescens:	annulipes:	agilis:	prismaticus:		
Connecticut-----:	--	1,987	1,183	-	-	3,170	
Massachusetts---:	575	-	-	-	-	575	
Michigan-----:	3,223	-	-	-	-	3,223	
New Hampshire---:	593	-	-	-	-	593	
New Jersey-----:	593	270	450	20	61	1,394	
Ohio-----:	1,074	-	-	-	-	1,074	
Vermont-----:	2,279	-	-	-	-	2,279	
Virginia-----:	490	-	8,627	-	-	9,117	
Total-----:	8,827	2,257	10,260	20	61	21,425	

A total of 4,319 adults of L. grisescens and 1,257 I. punctoria were shipped to the parasite laboratory at Belleville, Ontario, Canada, for release in the area infested by the borer in that region.

JAPANESE BEETLE CONTROL

Inspection requirements for movement of farm products lifted.--With the lifting on September 22 of the seasonal restrictions on the movements of farm products from the regulated areas on account of the Japanese beetle, the services of many temporary inspectors engaged in this work were terminated. With the arrival of cooler weather, a decided increase in shipments of sweetpotatoes from the Eastern Shore of Maryland was noted. Virginia inspections were made up entirely of sweetpotatoes and, as in the case of Maryland, these shipments showed a decided increase since the first of September. A decrease in numbers of beetles in the Philadelphia, Pa., area permitted the elimination on September 11 of screening and intensive inspection requirements for refrigerator-car shipments. More huckleberries were certified from this area than for several years past. Shipments of the

heavier crop picked this year extended over a longer period of time, ending late in September. Usually the season closes the latter part of August.

Nursery and greenhouse scouting for Japanese beetle results in reclassification.--Nursery and greenhouse scouting was completed in practically all areas before the middle of the month. In the New England sector 156 beetles were found within 500 feet of classified establishments and 103 beetles were found on the premises of 9 establishments that are either classified or requested classification. In the New York City area beetles were found on or within approximately 500 feet of 32 classified establishments and 1 sand pit. Twenty-seven of these establishments are located on Long Island. Rescouting of class III premises was conducted at six New York nurseries, all of which had a divided classification prior to June 15, 1937. Beetles were found in the class I and class III sections of one establishment and in the class III section of a second establishment. Fourteen establishments or nursery units in the vicinity of New York City received a class I status following negative scouting of their premises. Several establishments in the Virginia and District of Columbia area that had been given a provisional class III status earlier in the year were changed to class I after summer scouting failed to reveal any Japanese beetle infestation. Adult Japanese beetles were found in the vicinity of Elmira, N. Y., as late as September 24.

Soil treatment at Washington Birthplace National Monument.--Under the supervision of two men from the Japanese beetle control office, the heavily infested area found during the summer at the George Washington Birthplace National Monument, Wakefield, Va., was treated with arsenate of lead.

Trap scouting for Japanese beetle in nonregulated territory concluded.---Trap scouting in the nonregulated area for the 1937 summer season has been concluded. Traps were set in 417 towns and cities in 24 States. Results of trapping in 1937 disclosed 30 first-record infestations, 10 of which were in Maryland, 6 in Ohio, 4 in Virginia, 3 each in Illinois and West Virginia, and 1 each in Georgia, Indiana, New York, and Pennsylvania. Beetles were caught in 65 communities in which incipient infestations have been previously determined. Trapping in 322 cities and towns gave negative results.

Beetles still being found on cut flowers.---Cut-flower inspections increased somewhat in September. Over 100 beetles were removed from infested cut flowers in the Philadelphia, Pa., area. In most of the Syracuse, N. Y., area there have been only a few light frosts and this accounts in part for the continued movement of cut flowers in large quantities from this area.

Fall shipping season of nursery stock started.---Several cars of stock have already been certified for three of the larger establishments of New Jersey. Two of the largest rose growers in the Philadelphia, Pa., area are each budding 50,000 more roses this year than they did in 1936. These two growers together will have approximately 1,800,000 roses for sale this year.

Collections of Dutch elm disease suspects increased in New York State.--Scouts in Connecticut and New Jersey collected fewer specimens this scouting season than were taken in 1936. New York increased the number of collections by sampling all minor symptoms and all English elms. The numbers of suspects collected in the various States are given below.

State	Specimens taken in		Increase or decrease
	1936	1937	
	Number	Number	
Connecticut-----	10,571	6,793	3,778 (minus)
New Jersey-----	25,722	22,036	3,686 (minus)
New York-----	15,913	37,406	21,493 (plus)
Outside States---	3,979	8,921	4,942 (plus)
Total-----	56,185	75,156	18,971 (plus)

Approximately 19 percent of the suspects collected in New Jersey during the 1937 foliar season were confirmed Graphium. In 1936, with approximately 3,500 more suspects submitted to the laboratory, the percentage was slightly higher.

Fewer diseased elms confirmed in 1937.--Systematic scouting for diseased elms has been concluded for the 1937 foliar scouting season. Approximately 1,325 fewer trees were confirmed as infected with the Dutch elm disease during the present scouting season than during the 1936 foliar season. Dates used for the comparison are May 30 to October 3, 1936, and May 29 to October 2, 1937. The numbers of confirmations in the various States are as follows:

State	Specimens taken in		Increase or decrease
	1936	1937	
	Number	Number	
Connecticut---	96	111	15 (plus)
New Jersey---	5,504	4,215	1,289 (minus)
New York-----	1,690	1,136	563 (minus)
Outside States:	22	35	13 (plus)
Total-----	7,321	5,497	1,824 (minus)

Eradicated trees are larger this year.--It is surprising to find that the average diameter at breast height of 3,521 Dutch elm diseased trees eradicated in New Jersey this year is 15-2/3 inches. Last year the average diameter was approximately 11 1/2 inches. From data available from an elm census made last winter in cooperation with the Morristown, N. J., laboratory, it was found that the average diameter of all elms was approximately 5 inches, and that less than 5 percent were over 15 inches in diameter. One of the largest trees eradicated this season was a 36-inch English elm, which was removed under a commissioner's order in Queens, N. Y. This tree exhibited only minor symptoms and was reconfirmed by culturing Graphium from two chips out of 59.

Autogiro scouting in protective zone.---Autogiro scouting assignments for the location of Dutch elm diseased trees in Marion County, Ind., Warren County, N. J., Rockland County, N. Y., and Northampton County, Pa., were completed during the month. In 71-1/3 hours of flying time, autogiro scouts in Sussex, Hunterdon, and Warren Counties, N. J., covered 404 square miles and located 239 individual and 15 groups of wilted elms. An autogiro scouting in Putnam and Rockland Counties, N. Y., covered 161 square miles in 50 1/2 hours of flying time and spotted 100 suspects. In 35 hours of flying time, an autogiro assigned to the protective zone in Monroe and Northampton Counties, Pa., covered 186 1/2 square miles and located 78 wilted elms. A total of 220 suspects were plotted on aerial township maps by the autogiro crew scouting in the Indianapolis, Ind., work area.

First cases of Gracium are confirmed in Redding and Weston, Conn.---First cases of diseased trees in the towns of Redding and Weston, in Fairfield County, Conn., were reported during the first 2 weeks in September. Weston was previously considered within the bounds of infection because of its geographical location. One new case was also confirmed in the town of Fairfield, in the same county. This is the first confirmation in this town since 1934.

Dutch elm disease survey in Indiana makes progress.---At the end of the September work period, the second survey of the entire diseased area plus approximately 3 miles of protective area in Indianapolis, Ind., were completed. Although the number of suspects collected continues to be high, no diseased trees have been located since the first week of August.

C. C. C. camps ordered to close.---Three C. C. C. camps assigned to Dutch elm disease work received tentative instructions to be prepared to close camp on September 30. These camps spent the last 2 weeks of the month bringing their work to an orderly conclusion and checking in tools and equipment preparatory to abandoning the camps.

Lumber shipments heavily infested with gypsy moth egg clusters.---Inspectors removed 78 clusters from 18 carload shipments of lumber consigned to points outside the New England area regulated on account of the gypsy moth. In addition, 59 egg clusters were removed from three shipments of second-hand lumber. Inspectors were somewhat surprised to discover a gypsy moth egg cluster on bittersweet, as this plant is seldom found to be infested.

Corn borer damage observed.---European corn borer infestations have caused considerable damage in central and southern Jersey. Cornfields totally collapsed, with populations as high as 43 corn borers per stalk, were observed by the Bureau's inspectors. Dahlia and gladioli growers are very much alarmed over the situation. Inspection of the establishments of 19 dahlia growers resulted in corn borer finds on all premises visited. This situation makes it imperative to carry on extremely close inspection on account of the European corn borer.

FOREST INSECT INVESTIGATIONS

European spruce sawfly in New England.--H. J. MacAloney, of the New Haven, Conn., laboratory, reports as follows on Diprion polytomum Htg.: "Approximately 1,250 acres of red spruce on the north slope of Mount Monadnock, N. H., was practically defoliated by the second generation of the European spruce sawfly and nearly 3,000 acres immediately surrounding this area are heavily infested. In several smaller areas in this general vicinity the infestation is heavy, but data indicate that elsewhere in the State the infestation is light. In Vermont there are two areas of heavy infestation where nearly complete defoliation occurs. One of these, covering about 2,000 acres, is on privately owned land near Wilmington; the other covers several hundred acres near Lincoln. The New York conservation department reports that no heavy infestations have been found in that State and that in some areas, at least, the infestation appears to be lighter than in 1935 or 1936."

Bark louse killing fir.--Mr. MacAloney reports that casual examinations of dying balsam fir, noticed during the spruce sawfly survey, indicate that the fir bark louse has increased in abundance since 1934. This is particularly noticeable in southern New Hampshire and in Washington County, Maine.

Wood borers damage lumber.--Mr. MacAloney reports as follows on wood borer damage to round-edged pine lumber: "Several requests for information on the prevention of damage to pine lumber by borers have recently been received. Examination of some of the stacks, containing six million feet, in a yard at Winchester, N. H., showed that most of the damage was in material sawed during the months of May, June, and July, when the Monochamus beetles are most active. Lumber sawed from October 1936 to January 1937 was only slightly damaged. The company was advised that square-edging the lumber or peeling the logs or lumber at a very slight additional cost would prevent attack."

Sawfly parasites liberated.--P. B. Dowden and P. A. Berry, New Haven, report as follows on the liberation of European spruce sawfly parasites: "On the 16th of September 500,000 more Microelectron fuscipennis Zett. were received from the Canadian parasite laboratory for liberation in the United States. They were liberated in colonies of 20,000 and 30,000 in the following general areas.

Place	Liberations	
	Colonies	Total parasites
	Number	Number
New Hampshire:		
Mount Monadnock-----	5	150,000
Temple-----	2	60,000
Stoddard-----	1	30,000
Vermont:		
Wilmington-----	11	170,000
Lincoln-----	3	90,000

Microplectron has been recovered at three more of the 1936 liberation points, namely, Tupper Lake, N. Y., and two points about 6 miles apart on the road from Lac Frontiere, Quebec, to Churchill Lake, Maine. Large collections of cocoons of Diprion polytomum Htg. were made by members of this laboratory staff and local help at Dublin, N. H. (Mt. Monadnock). The material has been brought to New Haven where it is being sorted and cleaned for parasite-rearing work. It is estimated that about 300,000 cocoons were collected. A few specimens of a chalcid parasite, tentatively determined as Chrysocharis laricinellae Ratz., have been recovered from Phyllotoma nemorata Fall. liberation points at Eustis, Maine, and at Stark, N. H. Although C. laricinellae has been recovered from Coleophora laricella Hbn. in this country, this is the first recovery from Phyllotoma. Liberations were made at Eustis and Stark in 1935."

Scale on pitch pine.--T. J. Farr, New Haven, reports as follows concerning Matsucoccus: "Further counts on killing populations bear out the theory already advanced that it takes a larger population of scale to kill pitch pine shoots than it does to kill short-leaf pine. Twigs were selected at random and were not picked especially for heavy or light infestations on the different species."

A sawfly in New Jersey.--R. T. Webber, of the Morristown, N. J., laboratory, examined a pine planting at Oakland, N. J., on September 16 to obtain information concerning an infestation of a sawfly, Itycorsia zappei Roh. The planting was said to contain about 5 acres of Pinus resinosa. Nearly every tree had been completely stripped of its old foliage and on some trees the new foliage had been partially eaten. The trees were found to be vigorous, thickly branched, and averaged 12 to 15 feet in height. At the time the examination was made the larvae had ceased feeding and entered the soil under the trees. They apparently drop to the ground when through feeding and in burrowing into the soil rarely migrate beyond the limits of the crown of the tree. In order to obtain some data on the abundance of hibernating larvae, part of the soil under one tree was examined and the larvae found were counted. A total of 661 larvae were found and, as the area examined was about one-fourth the total area under the tree, Mr. Webber estimated the population of the total area as being approximately 2,600 larvae. Approximately one-sixteenth of the area under three other trees was similarly examined. Based on the number of larvae found under these trees, the number of hibernating larvae was estimated at 1,400, 850, and 1,050 per tree, respectively."

Chemicals to kill trees.--R. R. Whitten and W. C. Baker, Morristown, have reported on results obtained in an experimental plot at Springdale, N. J. Late in December 1936 and early in January 1937 copper sulphate in dry or liquid form was applied to the trunks of living elm trees in this plot. This was part of an experiment to determine how worthless elms can be killed and rendered unfit for bark beetle attack. During September 1937 trees that received the "dry treatment" and trees that received the "liquid treatment" were felled, cut into sections, the bark removed, and counts made of the galleries of Scolytus multistriatus Marsh. and Hylurgopinus rufipes Eich. present. The counts showed that neither treatment, applied late in

December and early in January, can be depended on to prevent bark beetle attack. Results from using copper sulphate in liquid form were much more satisfactory than when it was applied in dry form.

Outbreak of fir tussock moth in Colorado.--J. A. Beal, of the Fort Collins, Colo., laboratory, reports that Hemerocampa pseudotsuga McD. has recently been found responsible for the death of practically all Douglas and white fir over an area of about 200 acres near Colorado Springs. This is the first outbreak of this insect in Region 2 that has been brought to the attention of this office. An examination of the annual rings of trees in the infested area indicated that the insects have been concentrated there for the last 5 years, although the outbreak has subsided and no active insects could be found. Heaviest killing appears to have taken place from 1 to 2 years ago, with some loss of trees this year from bark beetles and other insects. Apparently this outbreak was suddenly brought to an end by some very important natural control agency, such as adverse weather conditions or a concentration of parasites; however, it is now too late to determine the cause of this sudden disappearance of the insects.

Bark beetle surveys in Rocky Mountain region.--According to Mr. Beal, it is doubtful whether outbreaks of the Black Hills beetle (Dendroctonus ponderosae Hopk.) have ever been more serious and widespread in the Rocky Mountain region than at the present time. As a result of this condition, extensive surveys have been undertaken on five different national forest areas in the region and for this work five crews of three men each have been employed to work under the direction of the Fort Collins laboratory. Most of these surveys are made from the middle of August until the end of October and are in ponderosa, limber, and lodgepole pine types. The survey of the Medicine Bow National Forest in Wyoming, already completed, revealed the presence of 10,876 new infested trees. The Roosevelt National Forest survey in Colorado, still in progress, indicates the presence of about 20,000 infested trees on this forest. The Denver Mountain Parks survey in Colorado, still in progress, shows about 10,000 infested trees. There are also about 10,000 new infested trees on the Bighorn National Forest in Wyoming, as shown by the incompleting survey. No figures are yet available on the Dixie National Forest in Utah, which is also being surveyed. In addition to the 50,000 newly infested trees on four forested areas, there is a known infestation of 200,000 trees on the Elk Mountain, Wyo., area, where no control work is being attempted. There are also heavy and uncontrolled infestations on both the Shoshone and Washakie National Forests and, worse than any of these areas previously mentioned, is the tremendous infestation on the Shoshone Indian Reservation in Wyoming which, in number of infested trees, undoubtedly exceeds the total of all trees on other infested areas in the region. We are undoubtedly undergoing a period very favorable for the building up of bark-beetle epidemics, and are therefore faced with the problem of combating these outbreaks on a wide front.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Summary of Federal gypsy moth work during the fiscal year 1937.--An average of 2,492 W. P. A. employees were engaged in Federal gypsy moth work during the fiscal year 1937 in Maine, New Hampshire, Vermont, Massachusetts,

Connecticut, New York, New Jersey, and Pennsylvania. These men scouted nearly 1,499,500 acres in open country; more than 1,316,200 acres of woodland; approximately 8,106,000 apple, oak, and shade trees; and over 11,250 miles of roadsides. During the course of this work they creosoted more than 2,217,700 gypsy moth egg clusters. Thinning and cleaning work was done on more than 7,500 acres and over 4,600 trees in open country were cut. Burlap bands were placed around more than 1,044,500 trees and resulted in the crushing of over 1,321,200 larvae and pupae. More than 13,200 woodland acres and 5,700 residential properties were sprayed, as well as over 65,200 trees in open country. In conjunction with the spraying work, nearly 586,700 feet of wire fence was erected, and 664,500 feet removed. The excess in the number of feet removed over the number erected is explained by the fact that wire is not removed in a locality if the same section is to be sprayed the following year.

Efficiency and economy of saw-dust machine demonstrated.--The saw-dust machine, which was tried out experimentally last year, has been operating in the field under actual working conditions for several weeks. The worth of the machine becomes increasingly apparent with each experiment. Recent tests demonstrated that waste brush and wood, properly cut and piled, can be disposed of much more rapidly by using the machine than by burning.

Scouting begun near Canadian border.--On September 20 a regular employee, thoroughly experienced in gypsy moth work, was transferred from Greenfield, Mass., to the eastern section of Washington County, Maine. He is supervising the work of several men with previous gypsy moth experience in intensively scouting the vicinity of gypsy moth infestations discovered in that territory during the last fiscal year. By the end of September this crew had completed a thorough examination of all tree growth within a half-mile radius of the infestation discovered last year in Topsfield, finding no new infestation, and moved to the site of the infestation found last year in Indian Township. The work in this section is being done in conjunction with similar work by employees of the Dominion of Canada, who discovered several small infestations a short distance east of this area in the Province of New Brunswick.

Gypsy moth work in Vermont concentrated in difficult areas.--Scouting in some sections of Vermont is difficult, if not impossible, during severe winter weather, and other parts of the territory cannot be traversed during periods of high water. Both types of terrain are now being scouted for the gypsy moth as rapidly as available labor permits, in order that the work in these regions may be pushed as far as possible toward completion before unfavorable weather begins.

New infestation found near assembling cage which recovered moths.--A gypsy moth colony has been found in the town of South East, in Putnam County, N. Y. About 30 egg clusters have been treated at this infestation, which is located about one-quarter of a mile from an assembling cage where three male gypsy moths were recovered last summer. The infestation apparently originated through the transfer of a portable building from Dover, Mass.

Gypsy moth infestation discovered by blister rust crew.--Employees of the New York State Conservation Department, engaged on pine blister rust control work, discovered gypsy moth egg clusters on Trumbull Mountain in the town of Hague, Warren County, N. Y. This town adjoins the barrier zone on the west. The employment of additional W. P. A. men has been authorized to do the intensive scouting and treatment work necessary in that area, in accordance with the Federal control program, which includes the complete eradication of all gypsy moth infestations in or west of the barrier zone.

State gypsy moth inspection work increases in Pennsylvania.--Reports of violations of the State quarantine regulations relative to the movement of forest products in the gypsy moth infested area of Pennsylvania, by inhabitants who have started to cut their winter supply of wood, are increasing. Many of the people apparently have no knowledge of the regulations, as investigations have shown that most of those reported are first offenders. The demand for light scrap metal, such as automobile fenders and bodies, has increased in the Scranton district. Much of this material is picked up in fields and dumps near trees and shrubs favorable for the development of the gypsy moth and must be closely inspected before movement can be permitted. Inspection work is further increased by the large Wyoming Valley coal companies, which are expanding their operations in preparation for winter. This results in materially increasing shipments of mine timber, especially in the region of Penn Forest, Kidder, and Foster Townships. All of this timber must be inspected before it is moved.

Unusual hazards of gypsy moth work in Pennsylvania.--Gypsy moth scouting work in Pennsylvania is progressing satisfactorily, despite various difficulties encountered by the men in certain parts of the area. Rattlesnakes are seen daily in the mountainous areas, but they are becoming more sluggish as cold weather approaches. It has been necessary to modify the method of scouting of the crews in Barrett Township, Monroe County, because of the loose stones and boulders strewn on the precipitous slopes, endangering the workers. Numerous nests of wasps and hornets have been disturbed by workers engaged in knocking off sprouts and many of the men have been severely stung. The workers in one section were fortunate enough to find a blue-tinted clay which materially relieves the pain and reduces the swelling, when applied to the parts affected.

New infestations found in Vermont east of the barrier zone.--Six small gypsy moth infestations were found in the town of Ludlow, Windsor County, Vt. Five of them were single-egg-cluster infestations, and the other contained two egg clusters. Each of the locations will be scouted intensively after the foliage falls and the egg clusters become more clearly visible. These infestations are located farther west than any others found by C. C. C. enrollees in Vermont, but are a considerable distance east of the barrier zone.

Comparison of C. C. C. gypsy moth burlapping work in 1936 and 1937.--Burlapping work done by C. C. C. enrollees was completed on September 4. Less work of this type was done during the fiscal year 1937 than during 1936,

as fewer men were available for gypsy moth projects. In 1936, 2,104,157 trees were burlaped in 80 different towns, resulting in the destruction of 21,973,303 gypsy moths. In 1937, 1,796,066 trees were burlaped in 60 towns and 13,561,936 gypsy moths were destroyed.

Practical demonstrations of work at gypsy moth field meeting.--Approximately 80 persons attended the gypsy moth field meeting at Westfield, Mass., on September 2. These included 11 C. C. C. camp superintendents; 32 C. C. C. gypsy moth foremen; 15 men from the regular Federal gypsy moth organization; 10 foresters who were Federal, State, and C. C. C. officials from Vermont, Massachusetts, and Connecticut; and State officials in charge of gypsy moth work in the same 3 States. Several of the gypsy moth foremen manifested their interest by interrupting their vacations and attending the meeting at their own expense. The day was begun with a short indoor meeting at which C. C. C. gypsy moth work and certain phases of silvicultural work were discussed. Practical demonstrations of the work were shown during a trip to four points in the field.

PLANT DISEASE CONTROL

Costs of salt and brine treatments in West Virginia.--Tom Van Zanden, in charge of barberry eradication in West Virginia, reports as follows concerning comparative costs in treating barberry bushes with dry-salt and salt brine: "In an effort to determine comparative costs of the dry salt and the salt-brine treatment as a general field practice in barberry eradication, a practical test was made over a period of 4 hours, or $\frac{1}{2}$ day. The experiment was conducted under almost identical field conditions using four laborers and one subforeman, or 20 man-hours of labor, to each group of workers. It was found that at a salary of \$8.76 for labor, the cost of transporting materials to the eradication site when working with salt solution is approximately 100 percent more than the cost of transporting materials for the dry-salt treatment. The dry-salt treatment for $3\frac{1}{2}$ square rods required 1,308 pounds of salt, at a cost of \$5.10, whereas the salt-brine treatment for $12\frac{1}{2}$ square rods required 875 pounds of salt, at a cost of \$3.41. It was found that considerably more was accomplished with salt brine, at less cost for materials. The actual cost of eradicating 6,670 barberry bushes with dry salt was \$13.86, or \$0.0021 per bush. The cost of eradicating the same number of barberry bushes with brine would be \$3.34, or \$0.0005 per bush. Therefore, the practicability of salt brine over dry salt rests entirely on the item of transportation. The cost per bush will vary, depending on accessibility of water used in making the salt brine."

Progress of work in Colorado.--E. A. Lungren, in charge of barberry eradication in Colorado, submits the following report relative to the progress made in eradication since emergency money became available in August 1935: "Progress made in barberry eradication in Colorado with crews of security-wage earners since August 1935 is summarized in the following table.

County	Area : covered :	Properties : cleared :	Bushes ^{1/} : destroyed :	Relief : labor :	Nonrelief : labor :	Men employed : season 1937 :
	Square miles	Number	Number	Man-months	Man-months	Number
Adams-----	468	-	-	8.04	3.00	-
Arapahoe---	5	1	1	-	-	-
Archuleta--	216	13	156,858	336.15	20.50	49
Boulder----	288	4	11	7.57	2.50	-
Conejos----	144	6	82,200	192.74	5.50	23
Denver-----	50	1	2	3.85	2.58	6
Douglas-----	504	1	4	24.50	3.52	-
Fremont-----	432	2	5	13.16	2.25	-
Huerfano---	1	1	1	-	-	-
Jefferson--	15	1	1	-	-	-
La Plata----	684	125	2,156,642	1,287.59	22.68	99
Larimer-----	324	7	202	33.03	2.00	-
Morgan-----	468	1	1	31.90	2.50	-
Pueblo-----	756	3	11	47.36	4.51	-
Rio Grande--	396	19	765,174	492.57	20.55	31
Weld-----	1	3	5	-	-	-
Total-----	4,752	188	3,161,118	2,478.46	92.09	208

^{1/}By the use of 112.82 tons of salt and 6,550 pounds of Atlacide.

"Of the 16 counties listed, 4 (Archuleta, Conejos, La Plata, and Rio Grande) comprise the large areas of native barberry. The others contain large areas of Berberis vulgaris. Informational work was carried on in two of the counties listed, namely, Huerfano and Weld. In the 14 counties surveyed, 4,750 square miles have been covered, 188 properties infested with barberry have been found, and 3,161,118 bushes have been eradicated."

A by-product of Ribes-eradication work in the Northwest.--In 1935, by means of the bulldozer method, 150 acres of "stream bottoms" were cleared of heavy Ribes concentrations in Squaw Valley, on the Kaniksu National Forest. This method involves the clearing of associated brush along with the Ribes. In 1935 a little additional work with a disk was done to improve the land for the sowing of grass. In 1936 this area was seeded to timothy, redtop, and clover. In 1937 an excellent stand of hay was produced on the area, and the Forest Service proceeded to harvest the crop for the feeding of their mules and horses, which are used for packing on the forest. Contracts were let for the cutting and baling of this hay at a cost of \$8 per ton. The Forest Service had been paying \$17 a ton for hay. With approximately 125 tons from the area, the net return for 1 year's cutting will be about \$1,125. It is expected that the cost of the bulldozer work will pay for itself easily within 10 years, besides protecting some very valuable reproduction and pole stands of white pine. The cost of the bulldozer work was approximately \$50 per acre.

Time required for black currant survey in Ohio.--The State leader of blister rust control in Ohio has recently checked his 1936 records to determine how rapidly his men could cover a county in their search for and

destruction of cultivated black currants. He found that 1 black currant planting had been found for each 252 people in rural sections and 1 for each 556 people in urban districts. Counties having populations of less than 60 residents per square mile were covered at the rate of 3.9 square miles per man-day. Where the population was 64 to 122 per square mile, the men worked only 3.5 square miles each day. The other records were: Population 137 to 553 per square mile, coverage 1.73 square miles per day; population 843 to 2,954 per square mile, coverage 0.75 square mile per day.

Blister rust demonstration area.--The New Hope, Portage County, Wis., white pine blister rust infection area is not only serving as a splendid plot for infection-study purposes but is being used extensively for demonstration purposes. The area is an upland hardwood-pine type, typical of this Central Wisconsin forest type, and is reseeding to white pine in an extremely satisfactory manner. Young blister rust cankers were first observed in the area in 1935 and in the late fall of the same year 6 square chains (0.6 acre) were analyzed after the Ribes were eradicated from the entire area. The Ribes consisted mainly of R. cynosbati. In 1936 the 1,405 tagged trees, running from 6 inches to 10 feet in height, were again studied and it was found that of that number 208 had been killed by blister rust and 772 others were infected. The 1937 study is to be made this fall and in place of the dead trees it is planned to erect stakes 1 inch by 4 inches by 3 feet, with the bottoms creosoted, the tops painted white, and bearing a black stencil, "Blister Rust Killed a White Pine Tree that Stood Here." It is estimated that it will require almost 400 stakes to properly mark the white pine mortality on this plot.

Girl scouts aid in protecting white pine from blister rust.--On August 16 and 17 Miss Ruth Taylor and George C. Cramer took 11 Girl Scouts out for their first experience in white pine blister rust control work. Miss Taylor was Nature Counselor at the May Flather Girl Scout Camp located at Mt. Solon, Va., which is about 1/2 mile west of Stokesville, in the George Washington National Forest, where blister rust control crews were working. Mr. Cramer had charge of these crews. He explained to the girls how the rust infected the white pine and showed them blister rust on gooseberry leaves and on white pine. He then assigned eight girls as crewmen, two as checkers, and one as foreman. Each girl used a snake stick and uprooted the gooseberries by hand. In the 2 days the crew worked approximately 4 acres and uprooted 73 gooseberry bushes around their camp. On August 19 Miss Taylor brought 18 girls to an area near Reddish Knob, Va., where a regular blister rust crew was at work. They soon caught on to the way the regular blister rust crew worked, then formed a crew of their own and worked approximately 2 acres, uprooting 155 gooseberry bushes. While working in crew formation the girls discovered blister rust on gooseberry leaves, which aroused their interest more keenly than before. Miss Taylor, in commenting on this work, said: "I feel that the experience the girls had in working with Mr. Cramer in the control of blister rust was most valuable. Girl Scouts are much interested in conservation and the girls thoroughly enjoyed doing their tiny share in helping to save white pines, which they like so well."

COTTON INSECT INVESTIGATIONS

Soil animals and cotton root rot.--During the summer of 1936 investigations on the soil animals in root rot control plots were continued in the irrigated cotton areas at Sacaton, Ariz., by L. D. Christenson, of Tucson, Ariz., in cooperation with C. J. King, of the Bureau of Plant Industry. In the previous season's work it was found that heavy applications of organic material used for the control of cotton root rot had markedly increased the population of all the characteristic soil-insect groups and of mites. In 1936 the treatments of the plots were reversed. The plots that had received heavy annual applications of green or barnyard manures for 15 years were untreated, while the other plots were manured for the first time in 15 years. Quantitative studies of the soil fauna were undertaken to determine the initial effect of reversal of treatment on the populations. Soil samples were taken to a depth of 12 inches during June, July, August, and September from four plots receiving each class of treatment. The soil animals were extracted by means of Berlese funnels. When the first sample was taken on June 8 there was an exceptionally high population of 131 million mites per acre in the newly manured plots and only 30 million in the unmanured plots. Collembola were also abundant, with 12 million per acre in the manured plots and 22 million per acre in the unmanured. The spring application of manure had greatly stimulated the population of the mites, whereas the effects of 15-years' previous manuring still dominated the populations of Collembola. The other soil animals and insects were also more abundant at this time in the plots that had been manured for 15 years. These conditions changed, however, and by the end of the summer the pronounced increase in soil fauna brought about by the 15-years' manuring was entirely dissipated by 1 year of reversed treatment. A few forms such as Japyidae, Paurapoda, and two species of Collembola remained more abundant on the old manured plots. Samples from two other plots at Scottsdale, Ariz., manured for 3 years, and two plots at Coolidge, Ariz., manured for 1 year, were in general agreement with the results at Sacaton and indicate that improvement of soil structure and more abundant food supply brought about by manuring are responsible for the higher population densities in the manured plots. The 1936 studies corroborate the previous conclusions that control of root rot through manuring is achieved independently of the soil-animal fauna. The data do not indicate that the soil-inhabiting arthropods, together or separately, are responsible for root rot infection of cotton. In fact the opposite may be true, although the reasons are not obvious. It seems almost certain that the mycetophagous species are not numerous enough nor thorough enough in their feeding habits to reduce the root rot fungus to a noninfective quantity. If the soil animals do restrict root rot development, it may be due to their aid in the better distribution through the soil of microfloral organisms that inhibit root rot growth. In view of the meager information concerning the habits of arthropods living in the soil, such a statement must be made with reservations. The effect of the smaller soil animals on the growth of cotton seedlings was studied by planting cotton in heat-sterilized soil in flower pots. When the seed germinated representative populations of soil animals collected in the same kind of soil were added to half the pots. The initial growth of seedlings was faster in all cases in the soil containing the soil animals than it was in the defaunated soil. The increased initial growth in the faunated pots was possibly due to the inoculation of soil organisms with the arthropods, as final growth was better in the pots without the soil animals.

or less heavily infested, showing that there is no resistance to the pink bollworm in the complete sense of the word. However, studies indicate that a high lint percentage and a high lint index may be of some advantage in reducing or limiting the damaging effect of the pink bollworm on grade.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Gin-trash inspection.--Conditions have been very favorable throughout the month of September and, as a result, excellent progress has been made in gin-trash inspection. Some 10 crews have been working in north-central, west-central, and northwestern Texas; also in southwestern Oklahoma. Large quantities of trash have been inspected with negative results. Inspections were begun the first of the month in southern Alabama and Georgia and in northern Florida. Results have all been negative. A little laboratory inspection was carried on at one of the field stations. Some 2,600 green bolls were inspected with negative results. Last spring the city of Miami planted two small fields of cotton near Opa Locka, Fla., as an experiment. As this cotton began fruiting inspections were made from time to time, and the latter part of the month a living pink bollworm larva was found. Approximately 1,000 pounds of seed cotton had been picked, and when the matter was taken up with the proper officials this cotton was all destroyed by burning.

Destruction of stalks.--By the end of the month, at which time State regulations require that the destruction in the lower Rio Grande Valley of Texas of cotton stalks for control of the pink bollworm be completed, the stalks had been destroyed on approximately 95 percent of the cotton acreage. Most of the acreage remaining to be cleaned is in the northern part of the district, in what is known as the dry-farming section. Excellent cooperation is being received throughout the district, and indications are that practically all of the remaining acreage will be completed within the near future. No infestation has ever been found in this dry-land section and the plants have stopped fruiting; consequently, the fact that they were not destroyed by the exact time set will not handicap the program in any way.

Road-traffic inspection.--The road-inspection station in the lower Rio Grande Valley of Texas was in operation throughout the month and made slightly over 200 confiscations. This is a reduction over the previous month, due to the fact that most of the pickers had left the area by the middle of the month.

Thurberia-plant eradication.--The destruction of Thurberia plants in the Santa Catalina Mountains of southern Arizona has gone forward as usual. The first part of the month was devoted to recleaning some of the area previously cleaned, working out from Tucson. By the middle of the month the new camp had been set up and thereafter work was carried on from this point. Some 1,200 acres were covered without finding any Thurberia plants.

Wild cotton.--The latter part of the month a survey was made to determine the status of wild cotton in southern Florida. Because of unfavorable weather the survey was not as thorough as had been planned and was confined to the mainland keys. It was found that, as a whole, the plants had made rapid growth since the last recleaning $3\frac{1}{2}$ months ago, and ranged in height

from 1/2 inch to 5 feet. Blooms and small bolls were found on plants on two keys, and the larger plants in nearly all locations were squaring. The number of seedlings throughout the area is considerably less than last season.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Methods for control of tobacco flea beetle.--F. S. Chamberlin, of the Quincy, Fla., laboratory, reports that observations of experimental and commercial control operations against the tobacco flea beetle in 1937 justify the following conclusions respecting the control of these pests in the Georgia-Florida shade-grown tobacco district: (1) A dust mixture containing 1 percent rotenone is sufficiently toxic to control flea beetles on cigar wrapper tobacco in this district. (2) The best diluent for use on this specialized type of tobacco is sterilized, finely ground tobacco dust. (3) The dosage should be governed by the size of the plants. On newly set tobacco a dosage rate of approximately 4 pounds per acre should be sufficient, whereas large plants, nearing maturity, may require from 7 to 8 pounds per acre. (4) Although the duration of the efficiency of a rotenone-containing dust mixture for the purpose stated is limited to 2 or 3 days, under field conditions, applications made once a week should ordinarily protect the crop sufficiently. If a heavy rain follows an application, however, the treatment should be repeated. Under commercial conditions it is best to follow a definite dusting schedule during the principal part of the growing season. The attempt to time applications of the dust mixtures with flea beetle brood emergence seldom proves satisfactory. (5) In combating flea beetles on shade-grown tobacco, every effort should be made to keep the beetles in a state of continual subjection. Two procedures that assist greatly in this regard consist of the destruction of all tobacco stalks immediately after harvest and the application of rotenone-containing dust mixtures to the newly set plants immediately after they are transplanted.

Japanese iris tolerates heat treatment in delayed-planting experiment.--F. F. Smith, of the Beltsville, Md., laboratory, reports that Japanese iris plants held under conditions simulating transit for periods ranging from 7 to 10 days following treatment in hot water for 30 minutes at 110° F. to control the iris thrips (Bregmatothrips iridis Watson), grew just as satisfactorily as those planted immediately after treatment. In the course of this experiment half of the divisions of the iris were planted immediately after treatment, whereas the others were packed as for shipment, held for periods ranging from 7 to 10 days, and then planted. The foliage on the plants which were not set out immediately yellowed slightly and the new growth varied considerably in volume, but the foliage developed satisfactorily during the year and was approximately equal to the iris planted immediately after treatment.

Poison baits control mole crickets on golf courses in Florida.--J. N. Tenhet, of the Sanford, Fla., laboratory, reports that satisfactory results in the control of mole crickets (Scapteriscus spp.) on golf courses have been obtained with a poisoned bait consisting of wheat bran, cottonseed meal, molasses, and calcium arsenate, in the proportion of 50-50-1-7, applied at

the rate of 5 pounds (dry weight) per 2,500 square feet. This bait was broadcast late in the afternoon every 3 days for 2 weeks. At the end of this period it was estimated that the area of the golf courses showing evidences of mole cricket burrows had been reduced at least 90 percent and the use of the bait did not cause any injury to the grass.

Relative effectiveness of three insecticides against southern armyworm.--As a result of laboratory tests with a precision duster, C. B. Wisecup, Sanford, reports that three poisons--calcium arsenate, synthetic cryolite, and phenothiazine--used at three dilutions (1-1, 1-5, and 1-15) with two different diluents (sulphur and clay) and applied at two distinct dosages (1/40 and 1/20 g per application) against newly hatched and quarter-grown larvae of Prodenia eridania (Cram) showed the following: (1) While calcium arsenate was distinctly the most toxic material, phenothiazine was as good as synthetic cryolite with the quarter-grown larvae, much better than synthetic cryolite and almost as good as calcium arsenate with the newly hatched larvae. (2) There were only slight differences in mortality between the 1-1 and 1-5 strengths of the better materials, but the 1-15 strengths were inferior. (3) The use of sulphur as the diluent had a tendency to give higher mortalities throughout the experiment than when clay was used. This result may have been influenced, however, because of the known tendency of sulphur to settle out faster than clay, giving this material a marked advantage under the technique used in these tests. (4) The use of the larger dosage gave a total greater mortality, but with the smaller larvae there was only a slight difference between more concentrated strengths of the better materials, indicating that either strength should be effective. These tests indicate definitely that phenothiazine should be investigated further as an insecticide for use against the southern armyworm.

INSECTS AFFECTING MAN AND ANIMALS

Sand fly larvae have long developmental period.--Observations made by J. B. Hull, of the Savannah, Ga., laboratory, indicate that under certain conditions sand flies may remain in the soil in the larval stage for almost 2 years. Recovery cages, kept in the same place on the salt marsh for several years and protected against adults getting into them and against migrations of the larvae into soil areas which they cover, continue to yield a few specimens of adult flies from time to time.

Size of solid particles that can be swallowed by fly larvae.--Studies on the feeding habits of blowfly larvae by F. C. Baker, Washington, D. C., show that certain species are able to ingest solid particles of considerable size. By mixing powdered charcoal with the food and later examining the contents of the crops of the maggots and measuring the size of the charcoal particles found therein, it was found that third-stage larvae of Lucilia sericata Meig. had ingested particles 87 by 50, 25 by 161, 87 by 99 microns in size, Phormia regina Meig. 50 by 68, 12 by 81, 43 by 81 microns, and Sarcophaga securifera Vill. 37 by 124, 50 by 62, 37 by 74 microns. These findings are of importance in determining the necessary fineness of insoluble materials used as larvicides against these species.

Insect predators destroy large numbers of screwworms in carcasses.--
A. W. Lindquist, Uvalde, Tex., in further studies on the effect insect predators have in reducing the abundance of the screwworm fly (Cochliomyia americana Cushing and Patton) by destroying the larvae in carcasses of animals dying of screwworm infestations, has found that various species of ants are highly beneficial in this respect, as indicated by the following summary of data on the number of animals that died from screwworms, with percentage of emergence of flies.

		: Third-stage <u>C.</u> :	Emergence of	
Cases		: <u>americana</u> larvae:	<u>C. americana</u>	
		: when animal died:		
Number	:	Number	:	Percent
1936:	:		:	
7----	:	9,400	:	753 : 8.11
1937:	:		:	
19----	:	17,350	:	354 : 2.04
26----	:	26,750	:	1,107 : 4.14
Cases in which carcasses were protected from ants				
7----	:	3,044	:	2,892 : 93.03

Mr. Lindquist says: "The effectiveness of ants on C. americana larvae at carcasses appears to be due to the fact that ants find carcasses so quickly and are at hand to attack the migrating larvae. Eciton caecum Latr. has been the most frequently observed species at carcasses."

Eye gnats appear to be serious pests in Southeast.--In September a survey to determine the distribution, abundance, and economic importance of eye gnats (Hippelates sp.) in the area from Austin, Tex., to the southwestern part of Georgia was made by J. F. Bigham, of the Uvalde, Tex., laboratory. Mr. Bigham reports the following results of this work up to September 30, 1937: "By far the most strongly marked area of gnat infestation visited thus far is the section of southeastern Alabama and southwestern Georgia beginning about Troy, Ala., and continuing at least as far as Thomasville, Ga. In this area it is hardly necessary to inquire about gnats, for as soon as the truck is stopped they swarm into the cab in such annoying numbers that it is often necessary to get out of the truck in order to write notes. Other regions where there is considerable complaint about gnats are the strawberry-growing section around Hammond, La.; the section between Jackson and Waynesboro, Miss.; and several places in southeastern Texas. In the swampy sections of Louisiana there is much complaint about gnats, but there the situation is complicated by the presence of buffalo gnats and perhaps other kinds, so that one does not know how much of the blame to lay on Hippelates. At Taylor, Tex., gnats were reported to be very bothersome in the fields about cotton-chopping time in June. The Black Belt section of Alabama is distinctly a region of low gnat population. In general, gnats appear to be abundant in sandy regions and not abundant in black lands. This conclusion is derived both from personal observations and from what appears to be common knowledge of people living in the various sections. Sore eyes in children was reported as more or less prevalent almost everywhere. In southeastern Alabama and

southwestern Georgia it is distinctly a seasonal plague (called 'gnat sore eyes'), corresponding to the season of gnat abundance but most prevalent among school children early in the fall. In other sections the disease is not distinctly seasonal, although it was often reported as worse in the fall or spring. Many cases of pink eye in livestock were reported between Jackson, Miss., and Montgomery, Ala. Southeastern Alabama and southwestern Georgia are said to be almost free from pink eye. At several places in the latter area it was reported that there had been no cases since there were some among cattle imported from drought-stricken areas in 1934."

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Living larvae of the West Indian fruit fly (Anastrepha acidusa Walk.) and of A. suspensa Lw. were collected on May 18 in 14 grapefruits in the field at Arecibo, P. R. Three living larvae of the yam weevil (Palaeopus costicollis Marsh.) were taken at Seattle, Wash., on July 21 in yams (Dioscorea sp.) in baggage from China. Living specimens of the scale insects Fiorinia proboscidaria Green and Parlatoria ziziphus (Lucas) were intercepted at Boston on January 25 on lemons in ship's stores from Java. Living adults of Bruchus rufipes Hbst. arrived at Mobile, Ala., on July 12 in vetch seed mixed with rye straw used as packing in cargo from Scotland. A living specimen of the Egyptian mealybug (Icerya aegyptiaca Dougl.) was taken at Philadelphia on January 6 on a croton plant in ship's furnishings from the Philippines. Adults of the hairy vetch bruchid (Bruchus brachialis Fahr.) arrived at Savannah, Ga., on August 21 in hairy vetch seed in cargo from Czechoslovakia. A living specimen of the Philippine orange moth (Prays citri Miller) was intercepted at San Pedro, Calif., on August 4 in a lemon in ship's stores from the Philippines. Living specimens of the scale insect Diaspis simmondsiae Ferris were taken at Nogales, Ariz., on June 28, 1936, on the gojoba nut (Simmondsia chinensis) in baggage from Sonora, Mexico. Four adults of Bruchus luteicornis Ill. arrived at New Orleans on June 23 in vetch seed in cargo from France. The vetch seed was mixed with rye-straw jackets used as packing for wine. Living specimens of the coccid Chionaspis subnudatus Newst., as determined from the original description, were intercepted at Washington, D. C., on May 7 on Stapelea gigantia var. pallida in the mail from the Union of South Africa.

Weevil in horseradish roots.--Living larvae of Baris lepidii Germar were intercepted at New York on April 28, May 11, and July 6 in horseradish roots in cargo from Czechoslovakia. Living larvae of this weevil were also taken at New York in horseradish roots in cargo on May 12 and in ship's stores on June 22 from Poland. This species is recorded from middle and southern Europe. It is associated in literature records with the following cruciferous plants: Watercress, horseradish, peppergrass, rape, turnip, and white mustard.

Pathological interceptions of interest.--Anthostomella sp., unlike the two species described on orchids, was found on Oncidium speciosum from Mexico on April 20 at San Francisco. An undescribed species of Cladosporium was found on croton leaves in baggage from Mexico on December 3, 1936, at Laredo. Diaporthe perniciosa Marchal was intercepted on Malus sylvestris from Turkey

in February at Washington. Heterodera marioni (Cornu) Goodey was intercepted at San Francisco on September 8 on Anemone nemorosa vars. Blue Bonnet and Royal Blue from Canada, and on September 15 on Urbinia purpusii from Japan. Our first interception of the genus Lepriaurina was an undetermined species on an unidentified host from Jamaica on April 16 at New York. Macrophoma sp. with spores smaller than M. paeoniae Scalia was found on Paeonia suffruticosa from Japan on March 3 at San Francisco. Microdiplodia passeriniana (v. Thum.) All. and Phaeochora chamaeropsis (Cke.) v. Hoeh. were intercepted for the first time on April 19 at New York on a palm leaf in a box of cipollini from Morocco. A trace of what appeared to be Mycosphaerella calceoli Kirschst. and Kirulis was intercepted on Cymbidium giganteum from India on April 28 at San Francisco. Myxosporium sp., apparently undescribed, was found on February 3 at San Francisco on Paeonia moutan and on March 3 on P. suffruticosa from Japan. Peridermium sp., no species reported on Pinus halepensis, was found on the needles of a specimen of this pine from Italy on May 6 at New York. Phoma samararum Desm. was intercepted on January 30 at New York on Fraxinus excelsior seed from Italy. Our first interceptions of Phomopsis aucubae Trav. were made at New York on January 17 on Aucuba sp. leaves from Sweden; on February 5 on A. japonica leaves from Italy; and on March 3 on A. japonica berries from Japan. P. conorum (Sacc.) Died. var. naviculisporea Trav. was intercepted for the first time on February 27, on Picea excelsa cones from Germany. P. laurina Patrak, with spores smaller than description calls for, was intercepted on January 30 at New York on Laurus nobilis leaves from France. P. tineae (Sacc.) v. Hoeh. was intercepted on Viburnum tinus seed from Italy on January 30 at New York. Our first interception of Sclerophoma strobiligena (Desm.) v. Hoeh. was made at New York on August 31, 1936, on Pinus mughus cones from England. An undetermined species of Sclerotium was found on and in bulbs of Lycoris radiata from Japan on February 25 at Seattle. Sclerotium sp., associated with and thought to be a stage of Aspergillus sp., was found in caraway seed from Holland on March 30 at New York. Sphaerulina oryzae Miyake was intercepted for the first time on February 2 at New York on rice hulls from Japan. Sphaerulina sp., apparently undescribed, has again been intercepted on peonies from Japan (see News Letter for Oct. 1935, p. 23), this time at San Francisco on February 2 on Paeonia moutan varieties and on March 3 on P. suffruticosa. A rot in an apple from Tasmania intercepted at Philadelphia August 22 was found to be due to Spōrotrichum sp., similar to forms found on apples and pears in this country. Our first interception of Uredo behnickianum P. Henn. was made on March 31 at Washington on Oncidium sp. from Panama. According to Arthur's manual, this rust has been found on orchids in a greenhouse in New Jersey but is not known to occur in this country now.

DOMESTIC PLANT QUARANTINES

White-fringed beetles found at New Orleans.--A light infestation of the white-fringed beetle (Naupactus leucoloma Boh.) was found at New Orleans on September 22 on an area of approximately 10 acres along the docks in the extreme southern part of the city. Only dead beetles were found. A very thorough inspection of the water front and railroad yards, covering approximately 5½ miles, has been made in the city of New Orleans.

Animal-bone inspection for white-fringed beetles.--Investigation is being made at New Orleans as to the possibility of animal bones, large quantities of which are shipped from Argentina and other South American countries, bringing in these insects, dead beetles having been collected in the vicinity of such importations at New Orleans. Several tons of imported bones were recently examined at the above port and some dirt was found adhering to them, indicating they had been on the ground for some time. Most of the bones entering this country from South America are reported to come from the packing houses where they have been boiled for fat removal, but since a boat load consists of 8 to 12 box-car loads, it is altogether probable the bones may have been exposed to infestation before being shipped. It is reported that some of these bones are collected from the prairies and are probably not treated before shipment. Bones having particles of animal matter adhering to them on entering this country are required by the Bureau of Animal Industry, we are informed, to be heated to 300° F. Most of the importations, however, consist of dry bones, which are permitted to enter without any type of inspection or treatment.

Other infestations of white-fringed beetle.--A general-to-heavy infestation of the beetles covering approximately 30 city blocks was found at Pensacola, Fla., on September 9, including a part of the Louisville & Nashville Railroad yards and residential and vacant property. Only one cultivated garden was found infested. At Laurel, Miss., additional infestations were found a mile south of the known infested area the week ended September 25, bringing the total area in this locality to approximately 1,200 acres. A quarantine was placed by the State, effective October 5.

Near Naupactus at Gulfport, Miss.--A relatively heavy infestation of insects similar to the white-fringed beetle, and identified as Naupactus, species undetermined, has been found at Gulfport over an area about 4 by 1½ miles, also an infestation in a settlement 4 miles north of the town and another at Saucier, 18 miles north of Gulfport, extending 2 miles along the railroad. The food plants and feeding habits of the insect are very similar to those of N. leucoloma.

White-fringed beetle population.--Although the adult beetle population is greatly diminished, 200 beetles were found on 1 velvetbean plant during the week ended September 18; 30 adults were found in the main barrier ditch on September 23; adults were plentiful on the ground in peanut fields the week ended September 25; egg masses have recently been collected from peanut fields and from this year's pecans on the ground; and larvae of various sizes have been found feeding on the roots and burrowing into peanuts. Chufanuts were practically consumed. During the week ended October 2, 40 larvae, ranging in age from 10 days to maturity, were found under 1 peanut plant.

White-fringed beetle inspection.--Ten two-man crews are inspecting the leading seaports and other commercial centers in Alabama, Florida, Georgia, Mississippi, Louisiana, and Texas, centering their activities in areas near docks, railroad yards, mills, gins, and other points to which host material may have been transported. Intensive inspection is also being continued in the known infested areas for the purpose of determining the extent of infestation on all different types of properties. This work has resulted in

determining that approximately 700 acres of uncultivated land in the Florala, Ala., area are infested, also 160 acres of woodland in Walton County, Fla., the beetles apparently having spread from cultivated properties.

Regulatory and control work on white-fringed beetle.--On finding that beetles were being transported in seed cotton and that living adults exist in gin trash and cottonseed after it has passed through the gin, it has been necessary to restrict the ginning of cotton from infested fields to three designated gins, and all seed from such fields is allowed to move to one approved oil mill for immediate crushing. Inspectors are stationed at the gins and the mill to supervise the handling of these materials. The Pensacola railroad officials and the health department of that city are furnishing labor for cleaning up the infested area, and similar work is done by managers of pulp mills and pine-products plants. A patrol inspector is checking the movement of quarantined products from the infested areas. Several lots of such products moving without certificates have been intercepted.

Sweetpotato weevil control and eradication.--Cooperative surveys conducted since July by inspectors of this Division and the affected States have resulted in finding the weevils in 22 counties in 4 States--1 county in Alabama, 12 counties in Louisiana, 5 in Mississippi, and 4 in Texas.

Peach disease control activities.--Inspection for the peach mosaic and phony peach diseases has been completed for the season in Alabama, Arkansas, Indiana, Illinois, Kentucky, Louisiana, Mississippi, New Mexico, Pennsylvania, and South Carolina. A third survey of the Moab area in Utah has been made in cooperation with the State and a third survey in the Pali-sade area in Colorado is under way. A resurvey in Texas and Oklahoma of all nurseries around which infestations have formerly been found, was recently completed and no infestation was found on the nursery stock. Such work is also going forward in Colorado, New Mexico, Arizona, and California. Trees are being removed in Alabama, Arkansas, California, Colorado, Tennessee, and Texas. In September the eradication force averaged 340 relief and 34 nonrelief persons.

Inspection for citrus canker.--Inspection and eradication of Citrus trifoliata in Florida, carried on by 1 inspector and 25 relief laborers, were discontinued at the close of the month. The Alabama work was carried on by 1 inspector and 30 laborers in September. In Texas, Brazoria County is again being inspected and tree removal is under way in Harris and Galveston Counties, permission having been obtained for such eradication at several locations where the property owners had previously opposed such removal.

Blister rust found in Illinois.--White pine blister rust was found in four counties on the northern Illinois border in a survey in September which covered the entire tier of northern border counties in both Illinois and Indiana and which was participated in by inspectors of the Divisions of Domestic Plant Quarantines and of Plant Disease Control and by an Illinois

State inspector. Two inspectors were assigned to each State. The disease was found on cultivated black currants on 14 locations in the counties of Lake, Boone, Winnebago, and McHenry. Red currants and wild gooseberries were also found infected. No rust was found in Indiana, after careful inspection of the two locations where the disease was found 2 years ago, and after a survey of six counties bordering on the infected State of Michigan.

CONTROL INVESTIGATIONS

Diet influences resistance of larvae to poisons.--While conducting tests on the toxicity of organic compounds, A. M. Phillips, of the Sanford, Fla., laboratory, has found that the food on which mosquito larvae are reared has a definite influence on the susceptibility of the larvae to poisons. In general, he finds that the most resistant larvae are those reared on a food causing a maximum rate of growth. Preliminary tests showed that larvae of the same age reared on a medium of yeast and milk were approximately 30 percent more resistant to standard dosages of nicotine and phenothiazine than were larvae reared on a medium of yeast and blood. This illustrates the necessity for standardized methods of rearing for toxicological studies.

Insects and different instars of the same insect vary in resistance to nicotine.--In work on the efficiency of nicotine gas as a fumigant, H. H. Richardson and A. H. Casanges, Beltsville, Md., found that the third-instar larva of the silkworm (*Bombyx mori* L.) was of about the same susceptibility to nicotine as the younger (second) and older (fifth and sixth) instars of the insect. Surprisingly, the silkworm larva has about the same susceptibility to nicotine gas as does the average aphid. The results of tests with the southern armyworm (*Prodenia eridania* (Cram.)) were quite different, however, the resistance to nicotine of the first-instar larvae being definitely greater than that of younger or older larvae of the silkworm. Resistance also increased very greatly in the later instars of the southern armyworm, the last stage being about the most resistant insect found. Evidently resistance to nicotine bears no relation to the size of the insect and it varies greatly between different insects and in some cases between different instars of the same insect.

INSECTICIDE INVESTIGATIONS

New insecticide.--D. L. Vivian and H. L. J. Haller have recently been granted U. S. Patent 2694831, which covers the use as insecticides of hydroxy azo compounds containing at least one hydroxy group and at least one nitro group. It was found that 4-(p-nitrophenylazo)-resorcinol, when added to water at the rate of one part to 300,000 parts of water, forms a solution that kills more than 50 percent of culicine mosquito larvae within 16 hours. Another compound belonging to this class, namely 1-(p-nitrophenylazo)-2-naphthol, kills more than 90 percent of culicine mosquito larvae within 16 hours at a concentration of 1 part to 25,000 parts of water. It is believed that these compounds will prove highly effective against many of our worst insect pests.

BEE CULTURE

Japanese pagoda tree, *Sophora japonica*, yields nectar at Beltsville, Md.--C. E. Burnside, Beltsville, reports that a mature Japanese pagoda tree bloomed profusely on an abandoned farm in the Biological Survey game preserve at the National Agricultural Research Center. Both honeybees and wild bees visited the tree in such large numbers that their humming was clearly audible several rods from the tree. The honeybees were observed to enter the blossoms for nectar, and most of their activities seemed to be nectar gathering. It was not determined whether they were also gathering pollen. This tree is rare in the United States. It would apparently find favor as an ornamental tree, if more widely known, especially because of its late-blooming habit.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Valuable additions to collection of coleopterous larvae.--J. P. Kryger, of Copenhagen, Denmark, has sent to A. G. Boving for deposit in the collections of the National Museum coleopterous larvae of 44 species, all specifically determined by rearing, and including 11 species new to our collection. Brief biological notes accompany the specimens. This represents Mr. Kryger's annual gift of such material. For approximately 20 years he has been contributing regularly to our collections of identified coleopterous larvae, as a result of long personal friendship with Dr. Boving. Dr. Boving also reports the receipt of valuable reared coleopterous larvae from Peter C. Ting, of the California Department of Agriculture. Included are specimens of 13 species not previously represented in our collections.

Correct name for West Indian fruit fly.--It has become apparent that the commonest West Indian fruit fly, usually going under the name of *Anastrepha acidusa* (Walker), is not this species. It, therefore, becomes necessary to use another name. Sein in 1933 described the species under the name *Anastrepha fraterculus* var. *nombinpraeoptans*. It is, however, specifically distinct from the common South American *A. fraterculus* Wied. and should therefore be called *A. nombinpraeoptans* Sein. The name *acidusa* was applied to this species on the basis of a specimen in the National Museum collection bearing the label "Compared with type of *acidusa* Wlk. in British Museum by L. O. Howard, 1912." It was assumed that the specimen agreed, but recently it has been learned that C. V. Hooker, who collected the specimen, wrote in 1913: "This was first determined as *A. acidusa*, but comparison by L. O. Howard with the type of this species in the British Museum shows that the mango fruit fly is a different species, possibly undescribed." John Smart, of the British Museum, has compared a number of specimens of *nombinpraeoptans* from Jamaica, the type locality of *acidusa*, with the type of the latter species and declares them certainly to be not the same. The most striking difference is in the length of the ovipositor sheath, which in *acidusa* is 3 mm long, instead of less than 2 mm, as in *nombinpraeoptans*. No specimens have been found which agree with the type of *acidusa* and the species remains unknown except for the unique type. Miss Daphne Aubertin, L. O. Howard, and Dr. Smart have all studied the type of *acidusa* and have declared it to be different from the common West Indian species.

Additional United States record for a European sawfly.--Several specimens of sawflies recently submitted by J. S. Houser, Ohio Agricultural Experiment Station, Wooster, Ohio, and taken from mugho pine at Sidney, Ohio, were identified by Grace A. Sandhouse as Neodiprion sertifer (Geoffroy). This is the second record of the occurrence of this Palearctic species in the United States, the other being from the same host at Somerville, N. J.

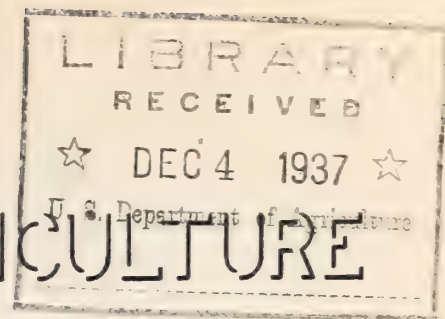
Ants as food of armadillos.--M. R. Smith has identified a quantity of ants submitted by the Bureau of Biological Survey and reported as having been found in the stomach contents of armadillos in Texas. The following 13 species and forms of ants were represented: Pheidole dentata Mayr, P. dentata var. commutata Mayr, P. natallescens subsp. splendicula Whlbr., Xiphomyrmex spinosus subsp. insons Whlbr., Eciton caecum Latr., E. schmitti Emery, Solenopsis xyloni McCook, Leptogenys elongata Buckley, Trachymyrmex septentrionalis McCook var., Ponera opaciceps Mayr, Monomorium minimum Buckley, Crenatogaster laeviuscula var. clara Emery, and C. victima subsp. missouriensis Perg.

Ants injure cabbage seedlings.--In September M. R. Smith received for determination from W. A. Thomas, of Chadbourne, N. C., some workers of a species of ant said to "have been particularly destructive to seedling cabbage" during the preceding month. The ants were identified by Mr. Smith as a species of Pheidole, apparently P. vinelandica Forel.

Living specimen of a tropical orthopteron taken in Washington.--A. B. Gurney reports that an interesting specimen recently added to the Museum collections is an adult female of Polyancistrus atlas atlas Rehn, found alive in bananas in a Washington, D. C., grocery store. Although the source of the particular bananas is not known, it is very likely Haiti or the Dominican Republic, because this genus of Orthoptera is not known to occur elsewhere and bananas are grown on the island. The subfamily Pseudophyllinae, of the Tettigoniidae, to which Polyancistrus belongs, is poorly represented in the United States, the true katydid, Pterophylla camellifolia (F.), being the best known native species; the American tropics, on the other hand, are inhabited by several dozen genera. The species of Polyancistrus are of unusual interest because of the rarity of individuals, their restricted known distribution, and the heavily sclerotized, shieldlike prolongation of the pronotum which extends above the base of the wings. The typical race of P. atlas was previously represented in the National Museum collection by two specimens and is known only from the area about Port-au-Prince, Haiti.

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TRANSFER OF MORMON CRICKET AND GRASSHOPPER CONTROL PROJECTS

During the past several years the administration of control work in connection with outbreaks of Mormon crickets and grasshoppers has been under the supervision of the Division of Cereal and Forage Insect Investigations and was directed by persons primarily assigned to investigational and research work on these insects. This additional work has materially interfered with the research programs, because the control work is conducted during the season when progress in research work is most important.

In keeping with the organization of the Bureau's work, it seems desirable to transfer the control activities to a division dealing exclusively with control work; therefore, any Federal control projects dealing with these insects undertaken during the spring and summer of 1938 will be placed under the direction of the chief of the Division of Domestic Plant Quarantines, B. M. Gaddis.

In making this change it is, of course, intended that the control operations will be carried on in close cooperation with the specialists of the Bureau connected with investigational work on these insects and the fullest utilization will be made of technical information developed by them.

FRUIT INSECT INVESTIGATIONS

Limb bands vs. trunk bands for codling moth control.--M. A. Yothers, of the Yakima, Wash., laboratory, has completed a test to determine the relative efficiency of placing beta naphthol- and oil-treated bands on the limbs instead of on the trunks of apple trees, and also of placing them on both limbs and trunks. When limb bands were used instead of trunk bands, 34 percent more codling moth larvae were caught, and the number caught by trunk bands was increased 60 percent by also using limb bands on the same trees. Limb bands require twice as much banding material as trunk bands and correspondingly more labor.

Fumigation of dried peaches.--H. C. Donohoe, of the Fresno, Calif., laboratory, carried out a series of tests to compare fumigation with shade-cloth protection, previously found effective when used on ranches to cover peaches while drying on stacked trays and during storage in picking boxes. Chloropicrin was used at the rate of about 1 pound per ton. After drying on stacked trays the experimental fruit was infested by the raisin moth (*Ephestia figulilella* Greg.) to the extent of 42 percent of the halves. Storage without further treatment allowed this infestation to increase to 99 percent. Unprotected storage followed by fumigation resulted in reduction of established infestation to 18 percent. Some of the same peaches were fumigated at boxing, after drying, and samples taken immediately after the fumigation were 0.26 percent infested. After this fruit had been stored without shade-cloth protection it was 100 percent infested, but when it was stored under cloth the average infestation was 12 percent. A portion of the peaches that were 0.26 percent infested after fumigation at boxing were stored without protection and fumigated again after storage. These averaged 4.8 percent infestation. The figures given are averages of five lots in each case. The periods of storage in boxes ranged from 12 to 18 days. The samples were examined 45 to 51 days after collection.

Studies of the peach borer in Illinois and Indiana.--O. I. Snapp, of the Fort Valley, Ga., laboratory, has been cooperating with State workers in experiments in the control of the peach borer in western New York and southern Illinois. Observations in New York indicated that more than 1 year may be required for the larval feeding period of some individuals in that area, as a number of practically full-grown borers were found early in October which could not have attained that size from eggs hatched in the present season.

Laboratory tests of insecticides for Japanese beetle.--W. E. Fleming, of the Japanese beetle laboratory at Moorestown, N. J., reports on tests carried on during the 1937 beetle season with various insecticidal materials for the Japanese beetle. Among the materials tested as repellents were a number of samples of derris impregnated with different codified materials by the Division of Insecticide Investigations in order to inhibit the decomposition of the derris by sunlight. The results were negative and indicated that the impregnation of derris with these codified materials not only did not increase the repellency of the derris but in some cases reduced the initial repellency without inhibiting the decomposition of the derris. The results also indicated that measuring the decomposition of rotenone by chemical means may offer no clue as to the effectiveness of the material as a Japanese beetle repellent. Oat flour, which has been reported as being of value in inhibiting rancidity in oil and fat-containing foodstuffs, proved to be of no value in inhibiting the decomposition of the repellent ingredient in derris. Ammoniacal copper sulphate when added to derris likewise did not modify the repellent value of the derris. Further tests with the derris-rosin residue emulsion combination now recommended for protecting early ripening peaches and plums from beetle attack, showed that at least three of the rosin oils can be substituted for the "rosin residue" in this spray. Preliminary tests with finely ground derris (passing through 200-mesh screen) indicate that the more finely ground material may be somewhat more effective as a repellent than are the coarser forms.

Chickens as probable agents in dissemination of diseases of Japanese beetle larvae.--R. T. White and S. R. Dutky report on tests with chickens fed on larvae infected with milky disease organisms and with others injected with spore suspensions of the organisms. It was found that chickens feeding on diseased larvae pass out viable and infective spores in their droppings, infection tests showing no reduction in the infectivity of such spores as compared with those taken directly from diseased larvae. It was also found that feeding diseased larvae to chickens or inoculating chickens with spores by intravenous injection produced no outward evidence of disease and the growth rates of inoculated chickens are comparable to those of uninoculated controls kept under similar conditions. The injected chickens received a total of 3 billion spores in a series of four injections over a period of 4 months. These experiments were conducted at the Moorestown laboratory.

MEXICAN FRUIT FLY CONTROL

A 3-year summary.--Throughout the last 3 years, ended June 30, 1937, traps operated in Texas took 437 Anastrepha serpentina Wied. Since July 1, 1937, these same traps have taken 497 of this species and 349 were trapped in October. Of this number, 197 were females. Only two of them, however, showed any signs of egg development. In addition to the A. serpentina, other flies not known to have hosts in the lower Rio Grande Valley were trapped as follows: A. acidusa Walk. group, 7; sp. "Y", 2; A. striata, 1; and one other specimen rarely taken in the valley traps, belonging in the A. pallens Coq. group. No adult A. ludens Loew has been trapped in Texas since July nor have any larvae been found in this season's crop. The specimens identified in October were as follows:

Species	Texas	Mexico
Adults	Number	Number
<u>A. ludens</u> -----	0	1
<u>A. serpentina</u> -----	349	8
<u>A. acidusa</u> Walk-----	7	0
<u>Anastrepha</u> sp. "Y"-----	2	0
<u>A. striata</u> Schin-----	1	1
<u>A. pallens</u> -----	65	0
<u>Pseudodacus</u> sp-----	1	0
Total-----	425	10
Larvae		
<u>A. ludens</u> ^{1/} -----	0	122
<u>A. serpentina</u> ^{1/} -----	0	56
<u>A. striata</u> ^{1/} -----	0	5
<u>A. pallens</u> -----	0	4
<u>Rhagoletis</u> sp ^{1/} -----	0	110
Total-----	0	297
Grand total-----	425	307

^{1/} From market fruit.

CEREAL AND FORAGE INSECT INVESTIGATIONS.

Variation of infestation in fly-test nurseries.--E. T. Jones, Manhattan, Kans., reports: "On September 7 and 8 the most extensive hessian fly resistance-test nursery we have yet attempted was sown at Springfield, Mo. In addition to 1,800 8-foot rows, representing 1,180 selections and more than 300 varieties of spring wheat, principally foreign plant introductions hitherto untested for fly resistance, a similar nursery containing a duplication of the 1,180 selections was sown simultaneously at Manhattan by H. R. Painter. In addition to these selections, consisting principally of F₃ crosses and back crosses of winter wheats with selections carrying fly resistance from Marquillo, several hundred F₅ selections stabilized for fly and rust resistance have been turned over to J. H. Parker for agronomic study, improvement, and final disposition. Incident to the extremely dry weather of the past season, desiccation of larvae and consequent late emergence of flies, little or no infestation can be found in Manhattan and vicinity. Although the plots were cultured for infestation, examinations continued to October 15 have shown no eggs on plants in the Manhattan tests. A similar condition has prevailed at Junction City, Kans. Turkey wheat from the borders of our early sown test nursery there have a light infestation of eggs and 12 percent infestation of red larvae. Dissection of puparia from stubble plowed under on August 10 shows 62 percent desiccated larvae, only 13 percent total (but recent) emergence, and 100 percent living larvae of which 75 percent have pupated, a very unusual condition. Representative samples of Marquis plants from Springfield borders show a plant infestation of 72 percent, tiller infestation of 59 percent, and an average intensity of four puparia per plant. Almost no white larvae are present but the plants carry a heavy second fall-brood egg infestation of more than 218 eggs per plant. If the larvae can develop before severe frost, all susceptible plants and lines in our Springfield tests will be annihilated by infestation."

Bantam sweet corn tests for corn borer resistance.--M. Schlosberg and R. Mathes, of the Toledo, Ohio, laboratory, report that of a group of 71 Bantam sweet corn strains tested in 1937 for resistance to the European corn borer, comprising 29 inbred lines and 42 hybrid crosses, 2 of the inbred lines gave evidence of resistance on the basis of the departure of their resultant mean borer populations from their expected borer populations, based on their relative conditions of development at the time of infestation of the strains, using as a criterion of resistance a negative departure of approximately twice the standard error of estimate. The same strains were found resistant on a similar basis in tests conducted with 61 Bantam strains in 1936. The inbred lines are 1828, obtained from the Michigan Agricultural Experiment Station, and 26-34, obtained from the Minnesota Agricultural Experiment Station. The inbred line 1828 was derived from a cross containing as one parent an inbred line of Maize Amargo, a strain of field corn which, although found to be agronomically undesirable, appeared resistant to corn borer attack. None of the other strains showed a negative departure of actual from expected borer population of at least twice the standard error of estimate.

Grasshopper population reduced in coastal counties of California.--

C. C. Wilson, of the Sacramento, Calif., laboratory, reports that in a recent survey of the coastal counties the number of grasshopper egg pods showed a material reduction since the survey in 1936. On many egg beds, examinations of samples of soil showed fewer than 1 egg pod per square foot; whereas, at the peak of the infestations in 1935, from 90 to 1,200 egg pods were recorded in these same egg beds. Apparently only a little bait will be necessary in this locality. However, if climatic conditions are favorable, hoppers may migrate into cultivated crops from the wide expanses of rolling hills, which are normally infested.

Egg predators take heavy toll of grasshopper eggs in California.--Mr.

Wilson also reports that an egg survey in San Luis Obispo County, where 440 square-foot samples from 43 egg beds were examined, indicated a material reduction in grasshopper egg deposition. There was a decrease of 43 percent in the number of eggs deposited in 1937 over that of 1936 and an increase of 29 percent in the number of egg pods attacked by bee, fly, and blister beetle. It is believed that these predators will constitute a material factor in the reduction of the prospective grasshopper population in 1938. The following table shows a comparison of the egg pods deposited in 1936 with those deposited in 1937 and the percentage of egg pods attacked by predators.

Year	Total egg pods	Total predators	Egg pods attacked by predators
	Number	Number	Percent
1936-----	2,188	675	30.8
1937-----	1,108	657	59.2

Distribution of grasshopper egg parasite throughout grasshopper area in Imperial Valley.--Examination by Mr. Wilson of alfalfa fields throughout the major grasshopper area in the Imperial Valley, Calif., indicated that the hymenopterous egg parasite Scelio n. sp., is widespread throughout the alfalfa-growing district. A second recovery was made 15 miles northeast of the place where the parasite was first collected in the spring of 1937. Preliminary examinations indicated that from 9 to 14 percent of the egg pods were attacked.

Second generation of lesser migratory grasshopper damaging crops in Imperial Valley.--Mr. Wilson also reports that examinations of the alfalfa fields throughout the Imperial Valley, Calif., indicated that serious damage may be expected from the depredations of Melanoplus mexicanus Sauss. This species was observed in stages ranging from second instar to adult, most individuals being in the fourth and fifth instars. The population was estimated to be 15 to 85 grasshoppers per square yard, on approximately 50,000 acres. In a number of fields the egg pods averaged 18 per square yard, and these will probably hatch this fall, causing considerable loss, unless measures are taken for control. Bait is being mixed and distributed by agricultural commissioner B. A. Harrigan.

JAPANESE BEETLE CONTROL

Fall shipments of nursery stock increasing.--Very dry weather during the early part of the month somewhat delayed the fall shipping season of nursery stock; however, activities increased appreciably in most sections by the middle of the month. In New Jersey over 250,000 plants intended for shipment to points outside the regulated area were certified during the month. Shipments were heaviest from South Jersey. Plant shipments from the Philadelphia, Pa., sector were heaviest to Southern States, over 143,000 plants being certified for shipment to Georgia and over 110,000 to Florida in October. Nursery and greenhouse inspection work increased considerably on the Eastern Shore of Maryland. One large establishment which specializes in fruit trees presented an inspection problem somewhat different from any other in this section. Instead of the usual sandy loam predominant in this territory, the soil in which the trees were grown is heavy clay which sticks to the roots and does not shake off readily nor wash off when dipped in the usual manner. It was found necessary, although slower and more tedious, to wash the roots of the trees with a pressure hose in order to clean them satisfactorily for inspection.

Inspectors supervise fumigations and treatments.--A total of 13 treatments conducted at 9 different establishments, 7 with a classified status, were supervised by inspectors in the New York City area. At one of the largest unclassified establishments on Long Island, 1 greenhouse was fumigated and 32 azaleas were treated with paradichlorobenzene as a demonstration. Some supervision has been given the State men who are treating the infested portion of the large nursery at Towson, Md., with miscible carbon disulphide emulsion. One quart of the emulsion, consisting of 1/2 part castor-oil soap, 1/2 part potash cocoanut-oil soap, 3 parts water, and 10 parts carbon disulphide, is being used to 50 gallons of water. Inspectors in northern New Jersey treated over 14,000 plants at 1 nursery with paradichlorobenzene. They likewise treated over 1,100 plants in the field of another nursery with carbon disulphide.

Restrictions on the movement of cut flowers lifted.--Discontinuation of the restrictions on the movement of cut flowers after October 15 resulted in the dismissal of several inspectors assigned to this work. In the Philadelphia, Pa., area, 109 beetles were removed from cut flowers during the inspection period. Beetles were found on cut flowers in this area as early as June 15, the opening day of the season, and the last beetles to be found were removed on October 1. Inspection at the wholesale cut flower houses in all sections continued until the quarantine was lifted.

Slightly fewer sand shipments from New Jersey.--Certification was granted during the month on approximately 270 cars of sand in the New Jersey area, somewhat under the amount certified during October last year.

Last beetles in the Philadelphia area.--The last outside find to be reported in this area was on October 15, when a beetle was picked from a canna plant in Fairmount Park, Philadelphia.

Dutch elm disease sanitation activities.--Selective cutting and clear cutting has been started in several areas where there is an abundance of diseased trees or where it is difficult to scout thoroughly. These areas are to be extended beyond the infection limits to natural boundaries, such as streams and roads, so that they may be well defined. An area in Clifton, N. J., having a localized concentration of diseased trees, with probable source of inoculum coming from a wood pile, was the first to be clear cut this fall. By the end of the month similar work was going on in most of the counties in the New Jersey infected area. A change in sanitation methods approved this month allows the stumps of removed trees to be 12 inches high, except on lawns or along curbs and roadways. Previously, the procedure was to cut stumps as low as possible. Trees under 2 inches in diameter will be grubbed out, whereas stumps of small trees are to be left from 6 to 8 inches. It is expected that this change will speed up the work and allow for a better chemical treatment of the stumps.

Root grafts spread infection.--A diseased tree eradicated during the last week of the month in New Castle, Westchester County, N. Y., almost escaped detection. No evidence of the disease was found in samples collected on August 25 and September 16. Graphium was finally isolated from specimens collected on October 21. Examination of the eradicated tree disclosed that streaking was well distributed throughout the larger limbs of the crown, but had not reached the tips of the branches where samples for laboratory diagnosis are usually cut. Research men of the New York State Department of Agriculture and Markets were able to culture Graphium from samples taken in August from a few small water sprouts. Entry of the disease apparently took place through root grafts with another elm 11 feet away, which was previously confirmed and removed.

Considerable decrease in confirmations for several areas.--A comparison of the number of diseased trees found in New Jersey in 1936 and up to October 16, 1937, reveals a general decrease for the entire State of 20 percent. Several lightly infected counties in which more extensive scouting had been performed showed increases. Eight counties in the infected area had decreases ranging from 16 to 60 percent. Staten Island, N. Y., shows a significant decline in the numbers of diseased trees reported since 1933, as follows: 18 in 1933; 53 in 1934; 326 in 1935; 70 in 1936; and 31 in 1937 up to October 25.

Dutch elm disease data.--Reports were received from the Morristown, N. J., laboratory during the month, confirming 378 trees as having Dutch elm disease. Of these, 327 were in New Jersey, 47 in New York, and only 2 in Connecticut. The remaining 2 cases were in Wileys Ford, W. Va., outside the general disease area. A total of 27,915 trees have been confirmed in all areas to date. Total trees removed to date in clear-cut areas number 1,216,094; dead trees removed number 2,231,146. The grand total of all trees removed to date in clear cutting, eradication, and sanitation activities is 3,507,085.

New infection centers in New Jersey.--Two new centers of infection have recently been found in New Jersey--one in ~~Tow~~ Tarkenton Township, in Hunterdon County, and the other in Green Township, Sussex County. The latter infection may be connected with the concentration in Allamuchy Township, Warren County. These new finds are partially responsible for the large number of confirmations reported early in the month for New Jersey.

Elm shipment certification refused.--Certification of four Chinese elms, intended for movement from Albertson, N. Y., to the United States Post Office Planting, Hamburg, N. Y., was refused by inspectors of the New York City office. Although eligible for certification under the Japanese beetle quarantine, certification could not be granted, as the shipment was destined to a point outside the area regulated on account of the Dutch elm disease.

Horses select elm trees for destruction.--An unusual condition has been found in northern Marion County, Ind. Approximately 1,000 elms that had been girdled by horses were discovered on a 500-acre farm which is used as pasture by about 100 horses. A similar condition on a much smaller scale was found on other farms. The horses apparently attack only elm, primarily American elm but occasionally a slippery elm.

Further confirmations at Wileys Ford, W. Va.--Two additional trees at Wileys Ford, W. Va., have been confirmed as having Graphium, bringing the total of diseased trees discovered in this area to five. Both trees were near previously confirmed elms. All trees in the immediate vicinity of the infected elms are being sampled and pruned.

Scouting results in Pennsylvania negative.--All field work was terminated in the Pennsylvania protective band on October 9. Approximately 1,100 suspects were collected during the season but no cases of Dutch elm disease have been reported.

European bark beetles discovered in new areas.--Infestations of Scolytus multistriatus Marsh. in several new locations have been reported by the Morristown, N. J., laboratory. This insect carrier of the Dutch elm disease was located in Antietam, Md., Bardane, W. Va., and several points within 30 miles of the latter area.

Hardwood pulp moved in large quantities.--An unprecedented number of requests for the inspection of hardwood pulp, moving by freight and truck from generally infested gypsy moth areas in northern Maine and New Hampshire to a pulpmill at Gorham, N. H., located in the lightly infested area, overtaxed the usual inspection facilities available in that area. Eleven additional men were assigned to inspect the shipments until other arrangements were devised. A recently perfected process whereby the pulp is turned into a hardwood sulphide, used in the manufacture of paper, rayon, and explosives, accounts for the sudden demand by the manufacturer. Investigation disclosed that the pulpmill, ignorant of the gypsy moth regulations, had contracted for 8,000 to 10,000 cords of hardwood pulp in the generally infested area for shipment to their plant at Gorham, N. H. It was also disclosed that a freight agent, in charge of several stations in the northern sections of Maine and New Hampshire, had authorized the movement of approximately 40 cars of pulp from the generally to the lightly infested area without previous inspection and certification. Gypsy moth inspectors, with the cooperation of the carrier, have located practically all these cars, thoroughly cleaned them, and burned the refuse removed from them. Under a special arrangement, all incoming shipments are now carefully checked by an inspector at the mill, the pulp is milled immediately, the

bark burned, and the trucks and cars are thoroughly cleaned as unloaded. These precautions make it possible to dispense with the inspectors first added to handle the actual inspection work. Approximately 500 egg clusters were removed from all pulpwood shipments during October.

Seasonal movement of evergreen products under way.--Shipments of evergreen products, such as boughs, trees, and roping, began to move from the regulated New England section during the latter part of October. Several gypsy moth inspectors are now busily engaged in the inspection of these products. During the 1936 season, 23 temporary inspectors were employed in the inspection of Christmas trees and other evergreen material used for Christmas decoration.

FOREST INSECT INVESTIGATIONS

Bark beetle control operations on the Coeur d'Alene.--J. C. Evenden, of the Coeur d'Alene, Idaho, laboratory, reports that the Forest Service, under the technical advice of the laboratory, is conducting artificial control on the Coeur d'Alene National Forest to eliminate five potentially dangerous "hot spots" of mountain pine beetle infestation in white pine. This project was instituted in October and will be completed the latter part of November, with approximately 4,000 trees being treated. These five rather small areas of severe infestation were disclosed during a survey of the forest conducted by the laboratory in August and September.

Bark thickness limits mountain pine beetle attack.--W. D. Bedard, Coeur d'Alene, reports that it was found that bark thickness, rather than height or diameter of the tree, was the factor that governed the height of insect attack. Regardless of the size of the tree, bark thickness at the top of the infested length ranged only from 0.2 to 0.4 inch. Although at any given height there was a wide variation in bark thickness within any diameter or height class, the taper in bark thickness from the base to the top of the tree was fairly constant. In other words, although bark thickness varied considerably at any given height, the decrease in thickness was fairly regular from the base to the top of the tree. With this variation in bark thickness within height and diameter classes it is apparent that there would be a wide range in infested length if it were correlated with either of these two factors. On the basis of bark thickness, the range in infested length is greatly diminished, and when the correlation is made on both bark thickness and height of tree, the range is even more materially lessened.

Locust borer injury not so severe in southern part of the Central States Region.--R. C. Hall, Columbus, Ohio, reports that the analysis of data from 440 sample plots, established in the States of Ohio, Indiana, Illinois, Kentucky, and Tennessee, indicates that locust borer damage is much less severe in the southern part of the region than in the northern part. For example, for an average site index of 50 feet in Tennessee the average injury index is 49 percent, whereas for northern Ohio the same site yields an average injury of 30 percent. There appears to be a definite gradient in injury, progressing from high to low, from northern Ohio to southern Tennessee. A summary table of this gradient follows:

Region	Site index	Injury index
	Feet	Percent ^{1/}
Northern Ohio----	50	80
Southern Ohio----	50	76
Indiana-----	50	72
Tennessee-----	50	49

^{1/} Injury index: 0, no injury; 1-33, light injury; 34-66, medium injury; 67-100, severe injury.

Oviposition responses of locust borer.--W. L. Baker, Columbus, reports that a preliminary analysis of data bearing upon oviposition responses of the locust borer, as obtained at Minerva, Ohio, this season, indicates a strong positive reaction to relatively high temperatures ranging up to 70 or 80° F. but a definite negative response as the temperature rises into the 90's. Continuous observation of several ovipositing females on comparatively cool days (air temperatures ranging from the high 60's into the middle 70's) showed a very marked tendency of the females to migrate around the trees from east to west as the day advanced, thereby remaining in an environment from 5° to 10° warmer than that on the shaded sides of the trunks. However, when the air temperatures ranged from the low to the high 80's the beetles showed the reverse reaction. At this time the bark temperatures in the sun ranged from the low to the middle 90's, whereas on the shaded sides they were as much as 16° lower. A series of records was taken of light intensities at the point of deposition of each egg, a total of 462 separate instances of oviposition being observed. General observations indicate less dependence of the females on light intensities than on temperature, inasmuch as during the coldest days and the morning hours of all days involved, cases of oviposition were rare or absent, although the light was as strong as during the days and hours of maximum oviposition.

Locust borer survival for the Cambridge, Ohio, experimental area.--H. C. Secrest, Columbus, reports that the partial analysis of activity records for Cambridge, Ohio, for 1937 indicates that the survival of locust borer larvae from early spring to the time of cutting of emergence holes was about 20 percent. The survival of prepupae and pupae was about 57 percent, making a total survival from early spring larvae to emergence of adults of about 11 percent. The data are summarized as follows:

Survival of stages	Number	Percent
Total larvae in spring-----	2,449	--
Larvae cutting emergence holes-----	488	--
Survival of larvae based on emergence holes cut:	--	19.9
Adults emerging-----	276	--
Survival based on adults emerging-----	--	11.3
Survival of pupae and prepupae-----	--	56.6

New distribution records for smaller European elm bark beetle.--Scolytus multistriatus Marsh. is considered the most important insect vector of the Dutch elm disease fungus in the United States. It was first found in the vicinity of Boston, Mass., in 1909. Until 1936 the insect was known to occur in only two distinct areas. One covered parts of eastern Massachusetts and southeastern New Hampshire. The other included parts of western Connecticut, southeastern New York, eastern Pennsylvania, northern Delaware, and northern New Jersey. In 1936 scouts connected with the Bureau's Dutch elm disease eradication unit found S. multistriatus at Parkersburg, W. Va. Since then that unit and the Morristown, N. J., laboratory have cooperated in getting additional information concerning the distribution of the species. C. W. Collins, Morristown, reports as follows concerning the results of this scouting: "S. multistriatus has been found to be well established in a large contiguous territory including parts of West Virginia, Ohio, Indiana, and Kentucky, bordering on the Ohio River from East Liverpool, Ohio, to Evansville, Ind. The known infested area lies mostly in Ohio and West Virginia. At some points in Ohio it extends back from the Ohio River approximately 50 miles and at some points in West Virginia approximately 60 miles. Two other infested areas have been found. One is about 225 square miles in extent and lies just south of Pittsburgh, Pa. The other area includes six localities where the beetle has been found in the vicinity of Martinsburg, W. Va. Five of these localities are in West Virginia and one is in Maryland."

Beech scale infestation increases in Maine.--R. C. Brown, of the New Haven, Conn., laboratory, reports that an examination made by L. D. Casey early in October of the permanent plots in Maine indicated a definite increase in the beech scale infestation. In a great many instances the scale infestation was from medium to heavy near the base of trees in 1936 but the infestation now extends to a height of 25 to 50 feet from the ground. No marked increase in mortality of trees over that recorded in 1936 was observed. The predator Chilocorus bivulnerus Muls. is apparently unable to check the progress of the infestation in Maine. The infestation in Scarsdale, N. Y., remains very light. Judging by the large number of Chilocorus in this area it appears that the infestation here is held in check by the feeding of this predator.

European spruce sawfly in New Hampshire.--H. J. MacAloney, New Haven, reports that a survey of mature spruce stands on the White Mountain National Forest in New Hampshire revealed that the European spruce sawfly was present in extremely small numbers. The same condition prevailed in Coos County, N. H., where large areas of spruce occur.

Light infestation of spruce bark beetle.--J. V. Schaffner, Jr., New Haven, reports that a reconnaissance of mature spruce stands on the White Mountain National Forest in New Hampshire was made early in October to determine the status of Dendroctonus piceaperda Hopk. One infested tree was found near Camp A of the Parker Young Company in the area of the east branch of the Pemigewasset River. On the Broad Tray Ridge Trail and another trail leading down toward the Waterville Valley Inn, a few infested and dead trees were found. Based on the number of trees apparently killed by this pest in this area in the last 1 to 5 years and the number of trees now containing broods, the indications are that the infestation is not noticeably increasing.

Notes on the biology of Matsucoccus.--Thaddeus J. Parr, New Haven, reports as follows on Matsucoccus sp. on pitch pine: "Early in the month the scales, having completed the second molt, began emerging from the holes in the bracts and traveled from the tips to the bases of the branches. The emergence continued until the third week, when all except those that had died from drowning in pitch, or for some reason were unable to push up out of the holes, had found shelter under the bark scales on the large branches and trunk, in some instances even down the main trunk to the ground. The mature females crowd into any small crack or crevice in the bark, where they are protected from above, and begin egg laying. Typically, the eggs are laid in a flat, elliptical pad behind the female. The pads of eggs are covered with woolly wax and contain a relatively large number of eggs. One counted contained over 400, with a few mature eggs still remaining in the body of the female. Egg laying continues at the present time and it is thought that the insects will overwinter in the egg stage."

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Heavy winds improve scouting conditions.--Scouting conditions were materially improved over the entire gypsy moth infested area during the latter part of October. Two severe rainstorms, accompanied by winds that sometimes reached gale force, stripped the foliage from most of the deciduous growth in many areas.

Intensive scouting near Canadian border makes rapid progress.--The areas adjacent to gypsy moth infestations discovered during the last fiscal year in the eastern section of Washington County, Maine, are now being scouted intensively by a special crew supervised by a permanent agent of this activity. Examination of a large woodland area in the vicinity of the Indian Township infestation was completed during the first part of October. Similar work was performed in the vicinity of the old infestations in Machiasport, Trescott, and Cooper, and the crew was working in Princeton at the end of the month. All of these towns are near the border of the Province of New Brunswick, where several small infestations were found during the last fiscal year by employees of the Dominion of Canada. No gypsy moth infestations were found in Washington County up to the end of October.

Scouting work expedited in more perilous sections of Vermont.--Gypsy moth scouting crews working in the more rugged sections of Vermont are making an effort to complete work in the most dangerous localities while the footing remains good. The work in some of the towns in the barrier-zone section of Vermont has been completed and considerable scouting has already been accomplished in several others, but no gypsy moth infestations have been found in this section.

Small infestations in barrier zone attributed to spread by wind.--Some single-egg-cluster infestations of the gypsy moth were discovered in the southeastern section of the Massachusetts portion of the barrier zone during the fiscal year 1937 which were attributed to wind drift from infestations outside of the eastern border of the barrier zone. Several small infestations in the same section but in localities not examined during the fiscal year

1937, have been discovered this year. The size of the infestations indicates that they became established at the same time as those found last year and probably originated from the same source.

Ground work stressed in areas where most egg clusters were deposited in low places.--Most of the gypsy moth egg clusters discovered in Canaan and Salisbury, in the northwestern part of Connecticut, early in October, were found close to the ground. As similar conditions were noted in other parts of the area, field employees engaged in scouting and cleaning work in Connecticut and Massachusetts are taking advantage of the prevailing favorable weather to accomplish as much low work as possible before snow falls. Scouting of the upper sections of the trunks and the branches of the trees will be done after the ground work has been completed in these sections, or after the lower egg clusters are hidden by snow.

New infestation in Connecticut portion of barrier zone.--A gypsy moth infestation was found the first week in October in the southeastern part of the town of Sharon, on the western edge of the State of Connecticut and within the barrier zone.

Cordwood inspected before removal from infested area.--A considerable amount of cordwood, recently cut in the vicinity of a gypsy moth infestation in Canaan, Conn., has been trucked to the New Haven, Conn., area and thence to market in New York State. A force of men has been detailed to carefully examine this wood stick by stick before it is moved from the infested area, as a precaution against the transportation of the gypsy moth eggs to uninfested territory. All standing trees and shrubs in the immediate vicinity of the cordwood were also carefully inspected.

Progress of work at isolated infestations in New York State.--Employees of the New York conservation department and W. P. A. workers under the supervision of this activity, who have been employed in scouting and thinning work in the vicinity of the large gypsy moth infestation discovered last year in Shawungunk, Ulster County, had located no new egg clusters in that town at the end of October. However, a single egg cluster infestation was discovered in the adjoining town of Wawarsing. A small number of new egg clusters was found and treated by the C. C. C. camp force working in the region of the large infestation discovered last year in Putnam Valley, Putnam County. Both of these infestations are located in the southern section of the State. The situation is different at the infestation discovered last September on Trumbull Mountain in Hague, Warren County, which is situated much farther north, near the southern end of Lake Champlain. Very close ground work is being done in the vicinity of this infestation and additional surrounding territory is being scouted by a force of over 60 W. P. A. employees working under the supervision of the New York conservation department. Nearly 7,000 gypsy moth egg clusters had been creosoted by these men at the end of October.

Two infestations found on the banks of the Lackawanna River.--Scouting along the banks of the Susquehanna and Lackawanna Rivers and in the adjacent lowlands of the gypsy moth infested area in Pennsylvania was completed in October. All trees and shrubs were carefully examined and much rubbish, such

as tin cans, boxes, barrels, driftwood of all types, and junk, deposited by the floods during the latter part of August, was closely inspected. The work in some sections was complicated by heavy layers of mud which covered the lower portions of the trees and much of the debris. More than 35 miles of river banks, extending through and beyond the area known or suspected to be infested by the gypsy moth, and including parts of 11 different townships, were inspected during this survey. All tree growth and debris on approximately 4,600 acres of open country and 190 acres of woodland were examined, and the work required more than 5,200 man-hours of labor. Two gypsy moth infestations were located, both in the boroughs of Taylor and Old Forge, in Lackawanna County. The infestations were about $3/4$ mile apart and extended along the river bank, many of the egg clusters being located on debris close to the edge of the water. One infestation consisted of 302 new egg clusters and the other of 28. Neither of the infestations present serious control problems and should be easily eradicated.

Assembling cages fail to reveal new infestation in Damascus, Pa.--A gypsy moth infestation was discovered during the first week in October in the west-central part of Damascus Township near the village of West Damascus, Wayne County, Pa. Damascus is outside the Pennsylvania quarantined area and is on the border of New York State. This infestation is located approximately 7 miles northeast of the colony discovered in Dyberry in 1937. Twenty-five egg clusters were found in a small apple orchard adjacent to a woodland area consisting of approximately 90 percent maple and a 10-percent mixture of basswood, cherry, birch, hornbeam, and elm. Intensive scouting and clean-up work had increased the number of new egg clusters to 60 by the end of October. About the middle of July 150 assembling cages were set out in Damascus, 1 of which was within the infestation, but all of the cages failed to attract male gypsy moths. This, together with several similar instances in the past, conclusively demonstrates that assembling cages are not entirely reliable in locating gypsy moth infestations.

Clean-up work to eliminate spraying on shore of reservoir.--Several reservoirs, which are the principal source of water for thickly populated cities and towns in the Wyoming Valley, are located in Spring Brook Township in Lackawanna County, Pa. Spring Brook is near the center of the quarantined area and was heavily infested by the gypsy moth. Very thorough clean-up work is being done around the shores of one of the largest reservoirs in order to stamp out the infestation so that spraying need not be done next season within 100 feet of the water's edge.

Scouting was principal occupation of C. C. C. gypsy moth enrollees in October.--From the end of the burlapping season to the first of October, C. C. C. enrollees were principally employed in thinning and cleaning work at known gypsy moth infestations. As the leaves began to thin out during the first part of October, some of the men were trained for scouting work. More men were transferred to this type of control work as scouting conditions became progressively better and during the latter part of the month scouting became the major activity. Piles of forest debris and slash are burned on days when there is no fire danger, so that accumulations of such waste material may be kept at a minimum.

Efficient work by C. C. C. gypsy moth crew.--Large gypsy moth infestations are usually easily found, as some of the egg clusters are so situated that they can readily be seen, and intensive scouting in the vicinity discloses the remainder. As the size of the infestations becomes smaller they are increasingly difficult to locate. The work of the gypsy moth crew from the C. C. C. camp at Plymouth, Vt., demonstrates the efficiency and thoroughness necessary in regions where the infestations are small and scattered. This crew discovered 12 single egg cluster infestations in the town of Ludlow, 4 in Cavendish, and 1 in Mount Holly, several of which were not clearly visible. This scattering of small infestations indicates that they, like the scattered infestations in the Massachusetts section of the barrier zone, originated from wind spread from infestations to the east or southeast, from which the small caterpillars were apparently blown up a valley in the direction of Rutland and the barrier zone.

PLANT DISEASE CONTROL

Progress of barberry eradication in North Dakota.--George C. Mayoue, in charge of barberry eradication in North Dakota and Montana, reports that during the period July to October an average of 22 security wage earners were employed in North Dakota in making a farm-to-farm survey in Stutsman, La Moure, Richland, Ransom, Grand Forks, and Steele Counties, where many bushes were found during the initial survey. There had also been reports by school children and some severe rust outbreaks in recent years, indicating that possibly some additional bushes remained. This work resulted in the eradication of 160 bushes and seedlings on 7 different properties. In Montana control work in recent months has been confined largely to timbered areas in Flathead and Lake Counties, where 855 bushes and seedlings have been destroyed on 9 different properties. In Minnesota since July 1 approximately 140 security wage earners have made a survey for barberry bushes in an area comprising about 3,500 square miles in the southwestern part of the State. Crews were located in Nicollet, Mower, Watonwan, Nobles, and Rock Counties. Most of the bushes found were obviously escapes from old plantings. In addition to the work in the western part of the State, a complete survey of Houston County has resulted in the eradication of many isolated and large fruiting bushes. In view of the topography, wide distribution of barberries, and the fact that some bushes were planted in this county as early as 1850, a future reinspection of practically the entire county will be necessary to destroy new bushes that develop from seed. The following table summarizes the progress in eradication since July 1.

Type	Properties	Total					
of	having bushes:	bushes			Sprouting	Seedlings	
property:	Planted:	Escaped:	Planted	Escaped	bushes		
	Number	Number	Number	Number	Number	Number	
Old-----:	2	27	3	157	64	13	
New-----:	24	53	134	180	-	115	
Total--:	26	80	137	337	64	128	

According to L. W. Melander, bushes found in Minnesota during the last few months have been widely scattered and many of them proved to be sprouts from planted bushes that farmers had unsuccessfully attempted to eradicate several years ago. In one instance it was necessary to remove barberries from a buckthorn hedge that had been planted in place of barberries voluntarily eradicated by the property owner. Mr. Melander comments as follows regarding the use of line markers: "In the October 1, 1937, Bureau News Letter (vol. 4, no. 10, pp. 21-22) there was discussion of various methods of marking lines for survey crews and mention was made of a new type of canvas marker that had a fine screen for release of the powdered line. This marker has now been used for barberry survey in Minnesota over a period of several months and has proved very satisfactory and efficient. Contrary to appearances, it is not the "swatter" type, but is used more on the order of a sponge to serve as a guide when working among trees and other objects. Where it is necessary to put line on foliage, it is a simple matter to shake the powdered line on the object to be marked. The supervisors who have been using these markers prefer them to other methods that have been used heretofore in Minnesota."

Scouting for blister rust in California.--The annual work of scouting for white pine blister rust in California was begun about the first of August. In 1936 five infections, one on sugar pine and Ribes and the others on Ribes only, were found in northwestern California, a few miles south of the Oregon boundary. These were the first discoveries of blister rust in California. This year infection on Ribes nevadense was found during the very first days of scouting on the Trinity National Forest, about 100 miles south of the discoveries of 1936. R. nevadense had never before been found infected in its native habitat. One bush, growing along a small mountain stream and scarcely eight feet from the water and at an elevation of about 4,500 feet, carried the rust. It was in good association with sugar pine. Notwithstanding a careful search of the vicinity, no more diseased bushes could be found. However, within 2 weeks four more infections on R. nevadense and R. cruentum were located about 10 miles to the south, and subsequently two infected R. sanguineum were found about 125 miles south of the Oregon-California line. A scouting party operating in the northern part of the Klamath forest found blister rust generally distributed in every drainage basin examined and principally in basins where no rust was observed last year. This indicates possible undiscovered pine infection centers probably to the north in Oregon, and exceptionally favorable conditions for the spread of the rust during the spring. Early in September another scouting party was sent into the Lassen National Forest, at the northern end of the Sierra Nevada. Shortly afterwards blister rust was discovered there on R. roezli on Mill Creek a few miles south of Lassen Volcanic National Park, and about 120 miles south of the Oregon boundary. This is the first known occurrence of blister rust in the Sierra Nevada, and affords the first tangible proof of the threat to the fine stands of sugar pine growing on its western slope. Thus the presence of white pine blister rust has been established in both the Coast Range and Sierra Nevada Mountains of northern California, at about equal distances south of the Oregon-California border. It should be clearly understood that many undiscovered Ribes infections undoubtedly exist both within and outside the area

found infected this season. All scouting operations in the sugar pine region were terminated the latter part of October because of inclement weather and defoliation of the Ribes.

Camp reliefer carries on thriving laundry and cleaning establishment.--The Cow Creek blister rust camp in California has one full-fledged laundry and cleaning establishment in operation. Almost over night business became so good that the proprietor, a camp reliefer, had to take a partner. Ordinary service requires 2 days, but special 1-day service can be obtained at no extra charge. The shop consists of two ironing boards, gasoline iron, and a dry cleaning and tailoring tent. The operator does this work entirely on his own time. He puts in his regular 120 hours per month on Ribes eradication and operates the laundry and cleaning establishment on the side after hours. This work does not, in any way, interfere with his regular duties.

Preeradication survey on National Parks.--At the request of and in cooperation with the National Park Service, preeradication surveys have been started in the Lassen Volcanic, Yosemite, and Sequoia National Parks. The object of this work is to gather essential information concerning the abundance and distribution of Ribes and white pines as a basis for planning control operations.

Pine-disease survey in the western white pine region.--During the summer a pine-disease survey has been carried on in the western white pine region. The returns have now been tabulated from sample strips worked in 24 drainages of the St. Joe Forest area in Idaho. These drainages contain 182,700 acres of white pine land and 128,965 trees up to about 20 feet in height were examined in the stream and upland types. This work resulted in the finding of 16,831 infected trees, or 13 percent of those examined. These trees had a total of 70,474 cankers, or an average of 54.6 cankers per 100 trees examined. Last year's survey showed an average of about 4.4 percent infection in this region and the jump to an average of 13 percent this year indicates the rapidity with which the disease is attacking the white pine. Young trees, especially, are being severely attacked and considerable losses in unprotected reproduction areas are inevitable.

COTTON INSECT INVESTIGATIONS

Early versus late-planted cotton.--Observations were made by K. P. Ewing and R. L. McGarr on the damage caused by several insects to early and late-planted cotton in Calhoun County, Tex. In this area cotton planting began this year on March 22, and most of the early cotton was planted by April 8; however, a considerable acreage of late cotton was planted in June. The season was favorable for early maturity and the early planted cotton had produced a good crop by the first of July. Flea hopper damage was spotted and, on the whole, comparatively light in the early cotton. There was a heavy infestation of flea hoppers in the late cotton during the latter part of June and until the middle of July. Boll weevils were fairly abundant at the beginning of the season but they did not have time to build up sufficiently to cause maximum damage, especially

in the open-prairie section, before the early planted crop matured. Many of the fields, however, had considerable weevil damage to the top crop and the late fields were severely damaged. Damaging infestations of the leaf worms appeared at about the normal time, though considerably later than in 1936. The early cotton practically escaped leaf worm damage, whereas most of the late cotton required from four to six applications of arsenicals to protect it from the weevils and leaf worms. The cotton bollworm was even more injurious to the late cotton and many farmers complained the damage this year was the worst they ever experienced. The combined attacks of the flea hopper, boll weevil, leaf worm, and bollworm reduced the average yield on 6,000 acres of late cotton to about 150 pounds of seed cotton per acre, and some of the fields produced so little cotton that it was not worth picking. The early cotton escaped serious insect damage and produced the best crop in the last several years, averaging about 865 pounds of seed cotton per acre on 19,000 acres.

Egg parasites of cotton flea hopper.--Studies were continued this season by H. J. Crawford, of Port Lavaca, Tex., on the biology and abundance of the egg parasites of the cotton flea hopper. Erythmelus n. sp. was found to pass the winter in the egg of its host in a stage not far enough advanced to darken the host egg. Emergence from overwintering eggs was observed from March 31 to May 15. The stage in which the other parasite, Anaphes anomocerus Gir., passes the winter was not learned. Erythmelus n. sp. oviposited in flea hopper eggs that were from 1 to 3 days old and adults emerged in from 10 to 12 days. Of the 30,610 flea hopper eggs collected this year from several host plants in 22 counties of Texas, 18.6 percent were parasitized by Erythmelus and 13.2 percent by A. anomocerus, or an average of 31.8 percent parasitization. The latter species was more abundant in flea hopper eggs deposited in horsemint in the spring and in bitterweed in the fall. In all other cases Erythmelus was either more abundant or the only species present.

Boll weevil resistant characters in cotton.--E. W. Dunnam and J. C. Clark, Stoneville, Miss., in their 1937 studies of the boll weevil resistant characters of cotton found the same trend in varietal characteristics as in the last two seasons. The results were more erratic this year, because normal rains were favorable for producing more succulent bolls than during the last two seasons. Six varieties of upland cotton with thin boll walls, six varieties with thick boll walls, and one variety of Sea Island cotton were compared for boll size, boll-wall thickness, toughness of carpel lining, fruiting habits, leaf drop, and extent of second growth. Two series of bolls were collected from each upland variety, one early and the other late in the season. Each series consisted of samples of 10 bolls ranging in age from 12 to 32 days, collected at 4-day intervals. In the thin boll wall types the maximum boll diameter averaged 3.59 cm in the early series and 3.37 cm in the late, and was reached in bolls from 24 to 32 days old in both series. The maximum toughness of the inner carpel lining of the bolls, as measured by a resistometer, was also found in bolls from 24 to 32 days old in both series. The average pressure required to puncture the inner carpel lining was 1,021 grams per square millimeter in the early, and 1,036 grams per square millimeter in the late series of bolls. The maximum thickness of the boll walls was found in bolls from 16 to 20 days old and

averaged 2.3 millimeters in the early series. In the late series the maximum thickness averaged 2.0 millimeters in bolls from 16 to 32 days old. In the varieties with thick boll walls the maximum boll size occurred in younger bolls. In the early series of bolls the range in age was from 16 to 32 days and in the late series from 20 to 32 days. The bolls were also larger in the thick-wall types, averaging 3.90 cm and 3.60 cm in diameter in the early and late series, respectively. The maximum boll-wall thickness, averaging 2.7 mm, was found in bolls from 16 to 28 days old in the early series. In the late series the maximum thickness averaged 2.3 mm in bolls from 16 to 32 days old. However, the thick-boll walls were not so tough and required only 927 grams per square millimeter in the early series and 943 grams per square millimeter in the late series to puncture the inner lining. In both types of cotton the average boll diameter and the thickness of the boll wall decreased and the pressure required to puncture the inner lining increased as the season advanced. In the one series of bolls of Sea Island cotton the average maximum diameter was 2.95 cm in bolls 36 days old. The maximum boll wall thickness averaged 2.0 mm and remained the same in bolls from 12 to 52 days of age. The average resistance to puncturing the inner carpal lining was 564 g per square millimeter in bolls 52 days old, although this was only slightly greater than in bolls 24 days old. The walls of the Sea Island bolls were nearly as thick as the thin-wall upland varieties, but they were much softer and less resistant to weevil puncture over a longer period. Although the bolls on upland varieties grew larger early in the season, more time was required between the setting of bolls on a given fruiting branch. The time interval between the appearance of bolls early and late in the season was 5.78 and 5.53 days in the thin-wall and 5.87 and 5.37 days for the thick-wall varieties. The average percentage of leaves that dropped when the first crop matured was 17.0 percent for the thin-wall varieties, 5.8 percent for the thick-wall, and 5.0 percent for Sea Island. The average increase in plant heights due to second growth was 5.6 and 6.7 inches, respectively, for the thin- and thick-wall varieties. The thin-wall varieties produce smaller and tougher bolls at a faster rate, mature them more quickly, drop a higher percentage of leaves, and produce less second growth. All of these characters except the thin walls and small size of bolls are desirable in varieties to be grown where cotton is in danger of attack by boll weevil.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL.

Gin-trash inspection.--This work was completed in the Southeastern States in October. A thorough inspection was made of the domestic-cotton area in north Florida and trash was obtained from a large number of the gins in Alabama south of Montgomery, and in Georgia south of Macon. In South Carolina 2 weeks' inspection was carried on in the extreme southern part of the State. Results were negative in these four States. Gin-trash inspection in Oklahoma was continued throughout October with 2 units in operation, the results being negative. In the Texas Panhandle pink bollworms were found in the regulated counties of Terry, Gaines, Andrews, Cochran, Martin, and Dawson. The area just outside this regulated zone was covered intensively with a number of machines in operation, with negative results. Pink bollworm infestation in the Pecos Valley of Texas and New Mexico, as determined by gin-trash

inspection, was much heavier this season than at any time prior to 1937. Casual gin-trash inspection at a new gin at Deming, N. Mex., resulted in the finding of a fairly heavy infestation of pink bollworm in an area already under quarantine. Pink bollworms were readily found in gin-trash in the Safford, Ariz., area, although the number appears no greater than formerly. The Tucson, Ariz., area has apparently been free from pink bollworm infestation for several years. The pink bollworm appears to be present this season in all of the area from perhaps 10 miles north of Nogales to a few miles northwest of Tucson. This area is all under regulation on account of the *Thurberia* weevil.

Regulatory measures.--The tremendous production of cotton in the Texas Panhandle has taxed the facilities for ginning, compression, and oil mills; however, the facilities set up by this division for handling a normal crop of cotton under our regulations were capable of being expanded to take care of this unprecedented situation and there has been no complaint that movement of cotton products was delayed because of the pink bollworm regulations.

Destruction of stalks.--At the close of October approximately 99.5 percent of the original stand of cottonstalks had been destroyed in the lower Rio Grande Valley of Texas. The remaining 0.5 percent was either on acreage belonging to nonresidents who could not be located or on land in litigation. Stalks on some of this land were destroyed through cooperative movement on the part of nearby cotton growers. In fields in which the stalks were cut early in the season the stubs have sprouted and it is necessary for the inspectors to continue their contacts in order to have this stub cotton destroyed. It is not believed that any appreciable amount of material that could serve as a food for the pink bollworm has been allowed to form on the plants.

Road-traffic inspection.--The Marfa, Tex., road station, which guards the main road out of the heavily infested Big Bend district, was in operation during October, and inspectors attached to this station made a number of interceptions of cotton products infested by pink bollworm. Inspection revealed living pink bollworms. One lot of this infested material, had it not been intercepted, would have been carried to a noninfested section of Texas. Many cotton pickers launder their cotton-picking sacks before leaving the heavily infested Big Bend district so as to be able to pass them through the Marfa road station. The Mexican fruit fly service took over the road-traffic inspection station leading out of the lower Rio Grande Valley in October but several of the personnel, who were on this station while it was operated as a pink bollworm station, continue in service. They and the others assist in preventing cotton products from being illegally moved out of the lower Rio Grande Valley.

Thurberia-plant eradication.--Fewer plants than normal were found in the area which was covered during the month of October; however, a rather large territory was intensively covered and eliminated from further consideration.

Wild cotton.--Active eradication work was resumed in southern Florida during the last week of October. By the close of the month approximately 200

acres had been recleaned and approximately 20,000 plants had been removed. Of this number there were only 11 plants on which bolls had set. This indicates that the territory was left in good condition when the work was discontinued when the rainy season began. The wild cotton eradication work is being carried on with regular appropriation funds.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

Control for red spiders and thrips on tomatoes and cucumbers.--C. A. Weigel and R. H. Nelson, of the Beltsville, Md., laboratory, report that experiments performed against Tetranychus telarius L. and Thrips tabaci Lind. on greenhouse-grown tomato and cucumber plants, in which four sprays were applied at 4-day intervals, gave the following results: A derris spray having a rotenone content of 0.0056 percent was as effective as one with 0.0012 percent rotenone content; the derris sprays used were superior to cube sprays of the same rotenone content, the difference being explainable on the basis of the total extractives content, which was 18.6 percent for the derris and 12.3 percent for the cube; the addition of pyrethrum extract aided in killing thrips but did not improve the effectiveness of the sprays against the red spider; with sprays of the same rotenone content, containing sulphonated castor oil as a spreader, the result was a better kill than when either alkylphenylbenzenesulfonic acid, or rosin residue, was used; a proprietary insecticide containing an aliphatic thiocyanate, diluted 1-300, was as effective against the red spider as the derris spray plus sulphonated castor oil, and did not harm tomatoes, while a proprietary insecticide containing lauryl thiocyanate diluted 1-600 burned the plants severely after only two spray applications. In a second series of experiments, using the same insecticides as in the first but applied four times at weekly intervals, approximately the same results were obtained, except that on tomatoes the spray containing derris, pyrethrum, and alkylphenylbenzenesulfonic acid appeared to be as effective as the sulphonated castor oil sprays. The spray containing lauryl thiocyanate caused severe injury to both foliage and fruit of tomatoes. None of the other sprays caused any permanent injury to either tomato or cucumber. Although sprays containing sulphonated castor oil caused a noticeable spotting of the fruits, this condition was practically obliterated by following the normal practice of syringing the sprayed plants with water within 48 hours after the insecticides were applied. On the whole, a beneficial effect from the spraying was clearly demonstrated, since on the sprayed plants the foliage remained greener and the plants continued to bear fruit much longer than did the comparable plants in untreated plots, and the average number of living red spiders on the treated plots was so diminished as to permit healthy growth of tomatoes and cucumbers.

Sulphur as a repellent against green clover worm.--Recent experiments by L. W. Brannon, of the Norfolk, Va., laboratory, designed to determine the relative effectiveness of derris, derris-sulphur, cube, cube-sulphur, pyrethrum-sulphur, and sulphur alone, applied as dusts or as sprays for the control of the Mexican bean beetle in association with the green clover worm infesting snap beans, showed that in general the dusts were more effective than sprays for the control of the latter insect on beans. The derris and cube dust mixtures contained 0.5 percent rotenone, the derris and cube sprays

contained 0.015 percent rotenone, and the pyrethrum-sulphur dust mixture contained 0.1 percent total pyrethrins. Wettable sulphur was used as a spray at the rate of 2 pounds to 50 gallons of water. It was also noted that sulphur dust alone gave foliage protection against Plathypena scabra Fab. comparable with that obtained when sulphur was used in combination with derris, cube, or pyrethrum, and that a derris-sulphur dust mixture gave better protection than a derris-talc dust mixture. These results indicate that sulphur acts as a repellent against P. scabra and that in instances where this pest occurs in association with a Mexican bean beetle infestation, sulphur should be used as a diluent for derris or cube for the combined control of the two insects.

Sparse stands of Russian-thistle favor breeding of beet leafhopper.--In an investigation to determine the relationship between density of stand of Russian-thistle (Salsola pestifer A. Nels.) and its suitability for the development of populations of the beet leafhopper, D. E. Fox, of the Twin Falls, Idaho, laboratory, found that extremely dense stands of Russian-thistle dried prematurely and therefore were not suitable for the development of large populations of Eutettix tenellus Sak., whereas in areas where this favorite host plant of the insect was less abundant the population of E. tenellus increased progressively until fall. In stands where the Russian-thistle grew sparsely, the individual plants remained green and suitable as a host plant throughout the entire summer and early fall.

Wind velocity affects efficiency of rotenone dust mixtures against tobacco flea beetle.--The effectiveness of rotenone-containing dust mixtures against Epitrix parvula Fab. depends greatly on the wind velocity at the time of application, rather than on the time of day when such applications are made. This was demonstrated in a series of tests performed by W. A. Shands and his associates at the Oxford, N. C., laboratory. A series of applications of a dust mixture containing 1 percent rotenone was applied to small field plots at 6 a.m., at noon, and at 6 p.m. Although there was a slight indication that the maximum effectiveness was obtained when the applications were made at 6 p.m., the general conclusion was reached that this time of day coincided with the lowest wind velocity, and it appears that an effective mortality of beetles can be obtained by the proper application of the rotenone-containing dust mixture at any time of the day when the wind velocity does not exceed approximately 4 miles per hour.

Chemically pure isoamyl salicylate inferior to commercial grade in attractiveness to hornworm moth.--L. B. Scott, of the Clarksville, Tenn., laboratory, reports that tests with five lots of commercial isoamyl salicylate and one lot of this material which was chemically pure, show that the pure material was much less effective as an attractant to the moths of the tobacco hornworms Protoparce sexta Johan. and P. quinquemaculata Haw. than were any of the commercial brands. The pure material attracted only half as many moths as did the commercial material from which it was prepared and approximately one-third as many moths as the most effective commercial materials. Four of the five commercial materials attracted the moths in approximately equal numbers, whereas the fifth material appeared to be definitely superior to the other four. Future work is planned to determine the substance in the commercial material which functions most effectively as an attractant for the hornworm moths.

Insect damage to cigar tobaccos.--According to the reports of a survey performed by F. S. Chamberlin, of the Quincy, Fla., laboratory, in the Georgia-Florida shade-grown district, in 1937, it appears that the average loss on this type of tobacco attributable to hornworms (Protoparce spp.), the tobacco budworm (Heliothis virescens Fab.), and the tobacco flea beetle (Epitrix parvula Fab.) was 0.2, 0.3, and 1.7 percent, respectively. Although this survey was necessarily limited in scope, it is believed that it gives a fairly reliable index of the damage caused by the principal insects attacking cigar-type tobaccos in the area involved. It appears that in the absence of the preventive and direct control measures applied the insects mentioned would have seriously reduced the main part of the crop grown for cigar wrappers.

Wild peppergrass principal summer host of beet leafhopper in Arizona desert.--V. E. Romney, of the Phoenix, Ariz., laboratory, reports that extensive field observations during 1937 have corroborated observations in 1936 in demonstrating that one of the peppergrasses, Lepidium thurberi Wooten, is the principal host plant for Eutettix tenellus Bak. that infests other wild host plants in the Arizona desert areas after the early summer dry season. Mr. Romney has determined that L. thurberi is abundant in southern and southeastern Arizona and is the only plant, with the possible exception of very limited areas of Russian-thistle (Salsola pestifer A. Nels.), that sponsors E. tenellus during the early summer dry season. This plant is known to extend along the Mexican border for approximately 175 miles. Its distribution in Mexico is not known.

Dichloroethyl ether effective against wireworms and nontoxic to certain host plants.--M. W. Stone, of the Alhambra, Calif., laboratory, reports that a continuation of small-scale field plot tests with dichloroethyl ether in aqueous solutions of 6, 9, and 12 cc per gallon, applied at the rates of 1, 2, and 4 quarts, respectively, per plant, gave a mortality ranging from 67 to 100 percent of the wireworms, principally the sugar beet wireworm (Lioponius (Pheletes) californicus Mann.), which were infesting tomato, corn, cabbage, and potato plants. No plant injury occurred to any of these enumerated crops, except in instances where the 12 cc dilution was applied at a dosage of 1 gallon per plant.

INSECTS AFFECTING MAN AND ANIMALS

Young chickens favorable host for Gulf coast tick.--In biological studies on the Gulf coast tick, H. M. Brundrette, of the Valdosta, Ga., laboratory, has found that young chicks are fairly good laboratory hosts for the tick larvae, except for the fact that the chicks die off rapidly even when they are kept under good conditions and receive the closest attention. Whether this mortality is due to common poultry diseases or to some condition or disease induced by the ticks has not yet been determined.

Eye gnats and "sore eyes" in the Southeast.--Continuing an eye gnat survey in the Southeastern States, J. T. Bigham reports that in the area from Thomasville, Ga., east to Valdosta, north to Tifton, and west to Albany through Camilla and Moultrie, and from Valdosta south to Bartow, Fla., through Gainesville, Ocala, and Orlando, eye gnats and sore eyes associated with them

were reported to be generally a serious problem. In southern Georgia and northern Florida "gnat sore eyes" in the schools is confined almost entirely to the early fall. In central Florida "sore eyes" is reported to be prevalent during both the fall and spring. In many schools, a supply of citronella oil is kept on hand to treat the eyes of the students for repelling the gnats.

Wound-myiasis and the pH of wound secretions.--Studies on the pH of wound secretions by E. W. Laake, of the Dallas, Tex., laboratory, has yielded some important clues on the factors inducing wound infestation by screwworms. In guinea pigs it has been found that the mean pH value of the fluid of a fresh wound is 7.05. The pH of a wound infested with larvae of Cochliomyia americana Cushing and Patton increases slowly on the alkaline side during the first and second days of myiasis, but from the second to the third day there is a significant rise to a high of 7.31; then there is a rather uniform decrease to a value of 7.14 at the end of the myiotic period. During the post-myiotic period the mean values slowly drop but remain on the alkaline side of the scale for all pigs that die, whereas for all those that survive the mean pH drops over rather sharply to and remains well on the acid side. When guinea pigs showing acid, neutral, and alkaline wounds were exposed to screwworm flies it was found that the alkaline wounds were strikingly more attractive to the flies than were the acid wounds. In wounds having a pH of 6.1 to 6.3 no eggs were laid on two guinea pigs exposed, 5 eggs were laid on 5 wounds showing a pH of 6.5, whereas on 17 wounds showing a pH of 7.5, 469 eggs were laid.

FOREIGN PLANT QUARANTINES

Entomological interceptions of interest.--Living larvae of the Mexican fruit fly (Anastrepha ludens Lw.) were intercepted at Laredo, Tex., on September 15 and 22 in apples in baggage from Mexico. Fifteen living larvae of the Mediterranean fruit fly (Ceratitis capitata Wied.) were intercepted at New York on September 9 in two hawthorn (Crataegus sp.) fruits in baggage from Italy. Three living larvae and three living pupae of the same fruit fly were found in the container. C. T. Greene reports as follows: "This record is interesting. It is my first record on hawthorn for this fly." An adult of the fruit fly Anastrepha morbinpraeoptans Sein (acidusa of authors) was taken in a trap in the field at Rio Piedras, P. R., on October 19. An adult of the weevil Apion pomonae F. arrived at Mobile, Ala., on July 6 in vetch mixed with rye straw in cargo from Scotland. A living specimen of the mirid Ceratocapsus apicalis Reut. was intercepted at Brownsville, Tex., on September 23 on a gardenia in cargo from Mexico. Four living larvae of the potato weevil (Epicaerus cognatus Sharp) were found at Roma, Tex., on September 25 in three potatoes in baggage from Mexico. Living specimens of the coreid Leptoglossus membranaceus Fab. were collected on July 7 on string beans in the field in Guam. This species is reported as also feeding on watermelons, cucumbers, cantaloups, and many other hosts in Guam. A living adult of the weevil Apion maculaalba Suffr. arrived at New Orleans on April 24 on a pineapple fruit in cargo from Cuba. Three living larvae and a pupa of the mango weevil (Sternuchus mangiferae F.) were intercepted at Seattle, Wash., on July 28 in three mango seeds in baggage from Hawaii. Living larvae and pupae of the mordellid Mordellistena cattleyana

Champ. were taken at Washington, D. C. on June 9 in orchid (Cattleya sp.) leaves in express from Brazil. The larva mines the parenchyma between the leaf surfaces. It does not leave the original leaf, either to feed or to pupate.

Weevils in the mail from Ireland.--Living adults of Apion virens Hbst. and Barynotus obscurus F. were intercepted at San Francisco on April 20, 1937, on primroses in the mail from Ireland. The tiny primrose plants were in soil. The weevils were probably accidental on the primroses. A. virens Hbst. is reported in European literature as common on red clover (Trifolium pratense). The shipment was refused entry and returned to sender, because it moved in violation of permit requirements, with prohibited soil, and on account of the presence of the insects listed.

Pathological interceptions of interest.--Diplodia tubericola (E. & E.) Taub. was found causing a rot of outer scales of a hyacinth bulb from the Netherlands intercepted at Boston October 6. This is our first report of the fungus on this host. A fungus determined by C. L. Shear as probably Guignardia vaccinii Shear was intercepted on August 25 at Washington on Vaccinium sp. from Saskatchewan. In giving the distribution of this disease, the Department's technical Bulletin 258 lists Nova Scotia only, in Canada. Two new hosts for Heterodera marioni (Cornu) Goodey were added to our interception file records, Andromischus trigynus intercepted at San Francisco October 4 from Germany and Pachyrhizus erosus at New York on October 22 from China. Leptosphaeria sp. was intercepted on October 25 at Philadelphia on rye straw from France. Neotylenchus, probably abulbosus, was intercepted on October 27 at Galveston in turnips from Wales. No Brassica species are listed as hosts of this nema in Goodey's manual. Phyllosticta sp. intercepted at New York on January 6 on holly leaves from Yugoslavia is said by the specialist to be clearly different from the species already named from this host. Puccinia angustata Peck was intercepted for the first time on October 29 on Scirpus sp. from Spain, at Philadelphia.

Narcissus treatment supervision.--During the season just past, 7,434 cases containing approximately 5,810,000 narcissus bulbs, were imported subject to hot-water treatment on arrival as a condition of entry. With the exception of a few small lots, most of which were received by mail, the treatments were applied, under the constant supervision of representatives of this Bureau, at privately owned plants. The cases were corded and sealed by the Bureau before delivery to the treating plants and at the latter points they were held intact until the inspectors could be present to break the seals and supervise the treatment. The treatments were applied at 11 plants in Washington (1,734 cases); 3 plants in Oregon (555 cases); 3 plants in California (113 cases); 1 plant in Illinois (34 cases); 2 plants in Michigan (55 cases); 1 plant in Massachusetts (41 cases); 8 plants in New York (3,181 cases); 3 plants in New Jersey (197 cases); 1 plant in Pennsylvania (284 cases); 1 plant in Maryland (463 cases); 2 plants in Virginia (434 cases); and 3 plants in North Carolina (295 cases). In addition, arrangements made provided for the application of treatments to approximately 55 shipments, totaling approximately 3,200 bulbs, which were received by mail.

DOMESTIC PLANT QUARANTINES

White-fringed beetle reported unimportant in South America.--Although the beetle has a wide distribution in Argentina and is considered somewhat harmful to crops planted in hard grounds and to crops in general, chiefly cereals, the insect is considered of no economic importance, according to a recent official statement by an Argentine Government entomologist. It is not often that adult beetles appear simultaneously in large numbers there, and even more rarely do they constitute a serious pest, he states. For these reasons a thorough study of the insect has not been made in that country. The white-fringed beetle is also reported to occur in other South American countries.

White-fringed beetle population.--Adult beetles were found the week ended October 30 near Florala, Ala., and Laurel Hill, Fla., and numerous beetles of Naupactus species were found the week ended October 9 at Saucier, Miss. At Pensacola, Fla., no beetles were found the latter half of October. Intensive house-to-house clean-up measures have been continued in this city, with the cooperation of local health authorities and railway agents. Larvae and egg masses were found near the last of October in fields and woodlands in areas previously known to be infested.

White-fringed beetle inspection and control.--In cooperation with pest-control officials of these States, 36 cities in Alabama, Florida, Georgia, and Texas, principally along the Gulf and Atlantic coasts, all outside the known infested area, were recently scouted for the white-fringed beetle, the work covering over 6,000 acres on more than 400 properties. Water fronts, railroad yards, woodyards, fertilizer plants, and premises of grain elevators, gins, cottonseed mills, junk yards, and other places were scouted, and data obtained on the routing of ships and the commodities received from foreign countries or from the infested States. No beetles were found in any of these cities. In the infested areas, intensive reinspection, investigation of industrial practices, and clean-up work were continued. Inspectors are placed at the one peanut-shelling plant and at cotton gins and cottonseed mills located in the infested areas or processing commodities produced in the infested areas. Over 1,000 permits had been issued through October for the movement of produce, chiefly cotton. Throughout the infested areas farms and woodlands are being surveyed and mapped as to acreage and kinds of crops produced, as a basis for recommending cropping and cultural practices and for other control action next spring.

Sweetpotato weevil survey and control.--During the Federal-State cooperative surveys in 84 counties in 5 States through October 31, the northern limits of sweetpotato weevil infestation have been defined in Alabama, Mississippi, Louisiana, and Texas. Outside of southern Louisiana, where infestation is heavy, 304 properties have been found infested in these States. Activities of county agents contributed largely to the excellent cooperation of growers. Thirty-five persons were employed on the project in October. Survey work was begun in Georgia on October 25, six State inspectors assisting. Inspection is now being made of sweetpotato tubers before they are banked or binned for home use or seed, and educational work is carried on with the growers urging them to select only clean tubers for

seed. Recent quarantines issued by Alabama and Mississippi restrict the areas where sweetpotatoes may be planted and the conditions under which they may be grown and require supervision at digging.

"Trapping" sweetpotato weevils.--The trapping of weevils by placing uninfested sweetpotatoes in fields or seedbeds from which all food material has been removed is found effective. On one farm in Mobile County, Ala., 417 weevils were taken by State W. P. A. workers from traps set in this manner. Before harvest the growers are required under State regulations to cut and remove all vines from the rows in order to provide a host-free period. The removal of volunteers is stressed, as several infestations have been found where only one or two volunteers remained in the field. After harvest the fields are thoroughly cleaned of all remaining tubers by "hogging" or plowing them. Under the supervision of an inspector, several weevil-free tubers are then placed in the clean fields at regular intervals to trap any remaining weevils. After about 15 days they are removed and burned. It seems probable that this method may materially reduce the weevil population.

Sweetpotato weevil infestation traced to labor transportation.--In harvesting the Irish potato crop in southern Alabama it was recently learned that truckers, in hauling laborers from a distance, have at several different times taken sweetpotato vines and slips to relatives in other parts of the county, and a recent infestation of sweetpotato weevils was traced to such movement. Such practices in the future will be prevented through State quarantine action and closer supervision of infested areas.

Sweetpotato weevils found in Walthall County, Miss.--Three farms were found infested with the sweetpotato weevil the week ended November 6, in Walthall County, Miss., bordering on known infested counties in southern Mississippi. These are said to be the first infestations known to exist in this county.

Sweetpotato industry in Texas.--Next to wheat, the sweetpotato crop is the largest food crop produced in Texas, with a value of \$3,432,000 in 1936, according to the State Agricultural Commissioner. Of the ten leading counties in sweetpotato production in Texas, weevils have been found in two.

Progress in control of peach mosaic and phony peach diseases.--Inspection for the phony peach and peach mosaic diseases has been completed in all States and field work is now concentrated on destroying diseased trees not removed at the time of inspection. Of the 33,000 diseased peach trees which have been destroyed this season, 14,500 were infected with phony peach, and 18,500 with peach mosaic diseases. All known infected trees have been removed from Arkansas, Illinois, Kentucky, Missouri, Utah, and South Carolina. The eradication of abandoned peach trees is going forward in nine other States. In Georgia, phony peach inspection was resumed on September 29, with eight Federal and nine State inspectors. The third survey in the peach mosaic infected area in Colorado this season resulted

in finding only 116 diseased trees. In El Paso County, Tex., and the Rio Grande Valley in New Mexico, cooperation in most instances is good and from 75 to 80 percent of the mosaic-infected trees are being removed.

California quarantine on peach mosaic disease radically changed.--Under the peach mosaic disease quarantines of California, as revised in October, an embargo is placed on the movement from the four infected counties in that State, and on the entry from infected counties of other States, of possible carriers of the disease. To the host list of peach mosaic and mosaic diseases of other stone fruits, have been added apricot, almond, prune, and plum trees and cuttings. One county in Oklahoma, in which the peach mosaic disease has recently been reported, has been added to the infected area as well as several counties in other States in which the disease is known to exist.

Peach mosaic in Mexico.--California plant-pest-control officials report that a recent limited inspection in Mexico of that part adjoining the infected area in San Diego County, Calif., showed that the disease was present in the adjoining Mexican area.

J. M. Corliss in charge of transit inspection.--J. M. Corliss, formerly responsible for supervision of transit-inspection stations throughout the Middle West, and the checking of white-pine-growing nurseries in that region for compliance with the blister rust quarantine, was recently placed in charge of these projects throughout the United States.

Transit-inspection activity increased.--In addition to recent assignments of transit inspectors at Alexandria, Va., Memphis, Dallas, and Atlanta, the transit inspection force is being increased at Cincinnati, St. Paul, Indianapolis, and Detroit. Inspectors from the Japanese beetle project are being assigned to the work at Boston, Buffalo, Syracuse, Albany, and New York for Christmas-tree-shipping inspection.

Citrus canker.--Isolated swamp lands in the Galveston-Brazoria areas in Texas, in which citrus canker has been found in recent years, were sought out, inspected, and about 44,000 abandoned and hedge trees destroyed. It was necessary to open a road in order to make these new locations accessible to eradication crews. Twenty-one relief laborers are now employed. No citrus canker was found in October.

Quarantine revisions.--Areas regulated under Federal quarantines relating to the pink bollworm of cotton, the Mexican fruit fly, and the Dutch elm disease, were extended to include small additions under recent revisions of the regulations. The State of Pennsylvania placed a quarantine, effective November 1, prohibiting the planting or growing of host plants of the black stem rust of grains anywhere in the State.

Terminal inspection.--Nevada City, Calif., has been added to the list of points where terminal inspection may be made in that State.

CONTROL INVESTIGATIONS

Susceptibility of insects at different times of year to nicotine.--Further tests by H. H. Richardson and A. H. Casanges at Beltsville, Md., with the adult codling moth confirmed the work of last spring in showing that insect to be very susceptible to nicotine gas, being similar to aphids in this respect. The dosages necessary to kill the adult moth in a 3-minute exposure were approximately the same as those found necessary last spring, indicating that the susceptibility had not changed much over this period of time. Similar results were obtained with the greenhouse thrips (Heliothrips hemerhoidalis (Bouche)), the green peach aphid (Myzus persicae (Sulz.)), and the bean aphid (Aphis rumicis L.), although the susceptibility of the last-named insect was slightly less than found previously.

Species vary widely in reaction to insecticides.--The variation in resistance of different species of insects to a given insecticide is strikingly shown in laboratory tests reported on by M. C. Swingle and James B. Gahan, of the Sanford, Fla., laboratory. After testing several hundred compounds on six species of laboratory-reared insects, it is almost impossible to say that any one species is generally more resistant than another. The imported cabbage worm and the cross-striped cabbage worm are susceptible to more of the compounds than are the southern armyworm, the diamond-back cabbage worm, the cabbage looper, and the cabbage webworm. There is a surprising variation among the last-named species to different compounds. A compound that will kill 100 percent of the armyworm larvae may have no effect whatever on the cabbage webworm, for example. With another compound this resistance may be entirely reversed. A compound is more likely to be toxic to one or a few species and rarely is one found to be generally toxic. The resistance of individuals in a species is also an important item in insecticidal work. There is a difference in resistance among individuals reared from the same female and under identical conditions and this difference increases greatly when rearing conditions are varied or among individuals from a mixed group of females. The reaction to different compounds is a species characteristic rather than an individual one.

INSECTICIDE INVESTIGATIONS

Composition of paris greens manufactured in 1936.--F. E. Dearborn, of the Division of Insecticide Investigations, has reported the results of the chemical analysis of nine brands of paris green manufactured in the United States (Jour. Econ. Ent., v. 30, no. 5, p. 804, Oct. 1937). All the samples were fairly uniform in composition and were not far from the theoretical content of arsenic. The greatest variation was found in the content of water-soluble arsenic, which ranged from 0.47 to 2.12 percent. The physical characteristics of these samples such as density, particle size, and bulking value have been studied by L. D. Goodhue and E. L. Gooden of this Division, and a report of their findings will shortly be published.

Levo-nornicotine found in *Nicotiana sylvestris*.--C. R. Smith has reported (Jour. Econ. Ent., v. 30, no. 5, pp. 724-727, Oct. 1937) that the

alkaloids from N. sylvestris consist of about 95 percent levo-nornicotine and about 5 percent levo-nicotine. Anabasine could not be detected in this species, but is the predominant alkaloid in N. glauca. Ordinary tobacco (N. tabacum) contains mostly levo-nicotine. The genus Nicotiana is of interest in that different species belonging to it contain different alkaloids, which, however, are closely related chemically, and all of which have valuable insecticidal properties.

Errors encountered in analyzing apples for spray residues statistically studied.--An article entitled, "A Statistical Study of the Sampling and Analytical Errors Encountered in Analyzing Apples for Lead Spray Residues", by C. M. Smith and C. C. Cassil, has just been published in the Journal of the Association of Official Agricultural Chemists (v. 20, no. 4, pp. 617-622, Nov. 1937). It gives the results obtained when each of 100 apples from each of several lots was analyzed separately for lead residue, and outlines the conclusions that can be drawn from a statistical consideration of the data. A chart is given from which it is possible to find how many apples per sample are needed to give results of any desired accuracy, so that conclusions as to difference in deposits resulting from different spray schedules, or differences in residue after washing by different procedures, may be soundly judged.

New insecticides patented.--D. L. Vivian and H. L. J. Haller have recently been granted public service patents covering the use as insecticides of a considerable number of synthetic organic compounds. These patents are as follows: 2095939, 2095940, 2095941, and 2096414. Among the compounds covered by these patents are 4-(2,5-dichlorophenylazo)-phenol, p-iodoazobenzene, 4-(p-bromophenylazo)-m-cresol, and 4-(o-tolylazo)-o-toluidine. This Division will be very glad to supply samples of the compounds covered by these patents to entomologists who may be interested in testing them against various insect pests.

Nicotine bentonite protected as an insecticide.--Claude R. Smith has been granted U. S. Patent 2096566, which covers the use of nicotine bentonite as a stomach poison for insects. Although nicotine has been used with bentonite by entomologists for some time, Mr. Smith was the first to show that the nicotine and bentonite combine to form a definite compound. Heretofore it has been assumed that the nicotine was adsorbed by the bentonite just as it is adsorbed by fuller's earth. The reaction between bentonite and nicotine is one of base exchange, similar to that which occurs when a hard water is passed through a zeolite water softener.

Perfume from pyrethrum flowers.--Mr. Haller and F. B. LaForge have found that dihydrojasnone may be made by the treatment of pyrethrum extract with hydrogen in the presence of platinum as a catalyst. Dihydrojasnone has a very pleasant odor in low concentrations and can be used with advantage as a perfume. A process of preparing this compound has been patented in U. S. Patent 2096715 granted on October 26, 1937, to Messrs. Haller and LaForge.

Thermoregulator.--L. D. Goodhue, of the Beltsville, Md., laboratory, has been granted U. S. Patent 2095738 which describes a new thermoregulator.

This device is of the type that depends on the change in vapor pressure of a volatile liquid with change in temperature. Suitable volatile liquids are ether, pentane, or carbon tetrachloride. This thermoregulator does not require sealed-in electrical leads and is made very sensitive by employing the principle of the differential manometer.

BEE CULTURE

Electric fences keep bears from apiaries.--G. H. Vansell and F. E. Todd, of the Pacific States Bee Culture Laboratory, Davis, Calif., who have been working in cooperation with Dr. T. I. Storer of the University of California, on the problem of combating bears in apiaries, report that electric fences can be successfully used for this purpose. Bears so dislike being shocked by electricity, that they react violently from such contact by jumping backward, and then running away. One bear, who had stood up and placed his front feet on the top wire of an electric fence immediately fell backward upon receiving a shock. He then hurried off, and climbed a tree about 75 yards from the fence. Seventeen bears were observed to remain away from an electric fence after receiving one shock. Three different kinds of fences were given field tests under simulated apiary conditions during the summer of 1937 in the Yosemite Valley through the courtesy of officials in the National Park Service. The results indicate that any type of fence giving a strong shock and capable of operating for a long period without undue attention is apparently satisfactory. As a rule, battery devices will be necessary for operation of fences about mountain apiaries because of their remote location away from power lines. It was found that a sturdy fence with about four positively charged wires carried on insulators is required. Posts must be set firmly and spaced not over 12 feet apart. The construction of effective fences has been studied in both moist and dry locations. Alternate "hot" (positive) and ground (negative) wires were tried but are apparently not sufficient, as the dense fur on the bear's body serves as an insulating medium. Best results are had when all the wires of the fence are connected to one side of the high frequency output and the other side is grounded. Where the soil becomes very dry, as in much of interior California during the summer months, a "ground" wire of netting completely around the outside of the fence is necessary. Under conditions where the soil is moist this metallic ground may not be required. Not only have properly designed fences been effective, but the cost of installation and operation are relatively low. The units tried out in these experiments, around commercial apiaries in mountain localities cost from \$10 to \$40 for materials. Installation is relatively simple. The consumption of current is so low that in the experimental work a set of four dry cells gave satisfactory operation for two months, making the cost about 3 cents a day. As bears are active mostly at night, installation of a sun-operated thermostat would automatically stop current flow during daylight hours, thus increasing the battery life. In one set of experimental apiaries in the Sierra Nevada, where very substantial fences with netting ground were set up, trouble from bears practically ceased. In another instance the results were not so satisfactory, as some bears passed through, but this was in an area where the soil was very dry and no ground netting was used. Much good beekeeping territory in the

mountains of the Pacific States has not been utilized for honey production because of the menace of bears to apiaries.

Area can be overstocked in relation to available pollen.--Messrs. Todd and Vansell also report that while the broodless apiaries in mid-summer are unusual even in California, this condition was experienced in a certain mountainous area this summer. Examination of the colonies showed that the pollen reserve had been depleted and not enough pollen was being obtained in the field to maintain a broodnest. The area was very well stocked with bees. Conditions were checked in a nearby area with a similar flora, but less well stocked, where brood rearing was found to be normal. It was concluded that the first area was overstocked in relation to the quantity of pollen available.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

A possibly serious coleopterous pest of roses.--Some coleopterous larvae boring in rose bushes recently submitted by R. K. Fletcher, of the Texas Agricultural Experiment Station, College Station, Tex., were determined by A. G. Boving as Chrysobothris sp.

European ant new to United States.--Several specimens of ants collected by A. B. Gurney in a pile of sawdust near Priest Bridge on the Defense Highway about 13 miles from Annapolis, Md., were identified by M. R. Smith as Ponera punctissima Roger, a European species hitherto not recorded from the United States. It is the sixth species of the genus Ponera recorded from America north of Mexico and is of special interest in that it has an ergatandrous form among its various castes. Since the genus is primitive in habit, P. punctissima is not expected to be economically important.